

SOLARWINDS

Virtualization Manager Administrator Guide



Copyright © 1995-2015 SolarWinds Worldwide, LLC. All rights reserved worldwide.

No part of this document may be reproduced by any means nor modified, decompiled, disassembled, published or distributed, in whole or in part, or translated to any electronic medium or other means without the written consent of SolarWinds. All right, title, and interest in and to the software and documentation are and shall remain the exclusive property of SolarWinds and its respective licensors.

SOLARWINDS DISCLAIMS ALL WARRANTIES, CONDITIONS OR OTHER TERMS, EXPRESS OR IMPLIED, STATUTORY OR OTHERWISE, ON SOFTWARE AND DOCUMENTATION FURNISHED HEREUNDER INCLUDING WITHOUT LIMITATION THE WARRANTIES OF DESIGN, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, AND NONINFRINGEMENT. IN NO EVENT SHALL SOLARWINDS, ITS SUPPLIERS, NOR ITS LICENSORS BE LIABLE FOR ANY DAMAGES, WHETHER ARISING IN TORT, CONTRACT OR ANY OTHER LEGAL THEORY EVEN IF SOLARWINDS HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

The SOLARWINDS and SOLARWINDS & Design marks are the exclusive property of SolarWinds Worldwide, LLC and its affiliates, are registered with the U.S. Patent and Trademark Office, and may be registered or pending registration in other countries. All other SolarWinds trademarks, service marks, and logos may be common law marks, registered or pending registration in the United States or in other countries. All other trademarks mentioned herein are used for identification purposes only and may be or are trademarks or registered trademarks of their respective companies.

SolarWinds Virtualization Manager

Version 6.2.0.1

Revised: 4/9/2015

| | |
|--|-----------|
| SolarWinds Virtualization Manager Administrator Guide | 18 |
| About SolarWinds | 18 |
| Contacting SolarWinds | 18 |
| Conventions | 19 |
| SolarWinds Virtualization Manager Documentation Library | 19 |
| Helpful tips and tricks | 20 |
| Chapter 1: Introduction | 21 |
| Why install SolarWinds Virtualization Manager | 22 |
| Key features of SolarWinds Virtualization Manager | 23 |
| Chapter 2: Installing SolarWinds Virtualization Manager | 25 |
| Minimum requirements | 25 |
| Browser requirements | 25 |
| Virtual appliance requirements | 26 |
| Port requirements | 28 |
| Master appliance | 29 |
| Federated collector | 31 |
| Data collection | 32 |
| Memory requirements | 33 |
| Disk space requirements | 34 |
| Expanding the provisioned disk size | 34 |
| VMware account permissions | 35 |
| SolarWinds Integrated Virtual Infrastructure Monitor Requirements | 35 |
| Installing Virtualization Manager as a virtual appliance | 36 |
| Installing Virtualization Manager on VMware vSphere 4.1 or later | 37 |
| Installing Virtualization Manager on Microsoft Hyper-V Server 2008 | 39 |
| Installing Virtualization Manager on Microsoft Hyper-V Server 2012 | 41 |

| | |
|--|----|
| Uninstalling Virtualization Manager | 43 |
| Installing the Integrated Virtual Infrastructure Monitor (IVIM) | 43 |
| Preparing for the integration of Virtualization Manager | 44 |
| Integrating Virtualization Manager for a VMware environment | 45 |
| Installing the SolarWinds Integrated Virtual Infrastructure Monitor in standalone mode | 47 |
| Integrating IVIM with Virtualization Manager | 49 |
| Possible issues during integration | 50 |
| Issues with credentials | 50 |
| Issues with importing nodes to the SolarWinds Orion server | 51 |
| Issues with changing the polling source | 51 |
| Issues with sending data to Virtualization Manager | 52 |
| Issues with the probe job | 52 |
| Managing nodes in the Orion Web Console | 53 |
| Upgrading an existing virtual appliance | 54 |
| Upgrading on vSphere 4.1 or later | 54 |
| Upgrading on Hyper-V | 55 |
| Additional upgrade steps for AD/LDAP authentication | 56 |
| Activating the license | 57 |
| Solving upgrade issues | 58 |
| Updating an existing Windows installation | 58 |
| Migrating from an existing virtual appliance to a new virtual appliance | 59 |
| Installing, updating and uninstalling a federated collector | 60 |
| Installing a federated collector | 61 |
| Updating a federated collector | 62 |
| Uninstalling a federated collector | 63 |
| Licensing | 63 |

| | |
|---|-----------|
| License management in Virtualization Manager version 6.2 | 64 |
| Activating the license on a standalone Virtualization Manager installation | 64 |
| Activating the license on Virtualization Manager integrated with the SolarWinds Integrated Virtual Infrastructure Monitor | 65 |
| New installation: | 65 |
| Upgrade: | 66 |
| Activating the license on a Virtualization Manager instance licensed per VM | 66 |
| Activating the license on Virtualization Manager integrated with SolarWinds NPM or SolarWinds SAM | 67 |
| New installation: | 67 |
| Upgrade: | 68 |
| License management starting from Virtualization Manager version 6.1 | 68 |
| Using licenses from previous versions | 69 |
| Viewing your licensing status | 69 |
| Activating a license key online | 70 |
| Activating a license key offline | 71 |
| Excluding hosts from monitoring | 72 |
| Chapter 3: Administration and setup | 73 |
| Basic setup | 73 |
| Filling in the SolarWinds registration | 74 |
| Configuring credentials | 74 |
| Configuring data sources | 75 |
| Configuring collection schedules | 76 |
| Infrastructure aging | 77 |
| Configuring SMTP settings | 78 |
| Configuring the Storage Manager installation details | 79 |

| | |
|---|-----|
| Configuring HTTPS access only | 80 |
| Enabling Dynamic Memory on Hyper-V 2008 servers | 80 |
| Advanced setup | 81 |
| User management | 82 |
| Setting default dashboards for users | 83 |
| Using inventory filters | 83 |
| Using labels | 84 |
| Configuring SNMP | 84 |
| Configuring authentication servers | 85 |
| Adding an Active Directory authentication server | 85 |
| Adding an LDAP authentication server | 86 |
| Synchronizing the time of the AD and LDAP server and the SolarWinds Virtualization Manager server | 87 |
| Adding AD and LDAP users to SolarWinds Virtualization Manager | 88 |
| Configuring system properties | 88 |
| Editing system properties | 88 |
| List of properties that may not be edited | 90 |
| Configuring system maintenance | 91 |
| Configuring server logging | 93 |
| Viewing the log files | 93 |
| Adding an SSL certificate to Virtualization Manager | 93 |
| Adding a self-signed SSL certificate | 94 |
| Adding a certificate from a certificate authority | 96 |
| Collecting data and calculating rollup information | 98 |
| Sample collection in a VMware environment | 99 |
| Sample collection in a Hyper-V environment | 100 |

| | |
|--|------------|
| Data rollup | 100 |
| Data retention | 101 |
| Aggregation | 102 |
| Infrastructure aging | 102 |
| Chapter 4: Key features | 103 |
| Dashboard | 103 |
| Explore | 103 |
| Capacity planning | 104 |
| Search | 104 |
| Common capacity management questions | 104 |
| How do I find performance bottlenecks? | 105 |
| How can I diagnose historic performance issues? | 105 |
| How do I create a virtualization capacity plan? | 105 |
| How can I solve VM sprawl, reclaim resources, and rightsize my virtual environment? | 106 |
| How much would it cost to move my virtual infrastructure to Amazon EC2? | 106 |
| Chapter 5: Dashboards | 108 |
| Dashboard basics | 110 |
| Common widget controls | 111 |
| Moving widgets | 111 |
| Displaying widget options | 111 |
| Opening related content | 112 |
| Widget types | 112 |
| Alert Monitor widget | 113 |
| Consumption widget | 114 |
| Content/Alert List | 114 |
| Facet View widget | 115 |

| | |
|---|------------|
| Fitment widget | 116 |
| Map widget | 117 |
| Notes widget | 118 |
| Performance Chart widget | 119 |
| RSS Feed widget | 119 |
| Top N widget | 120 |
| Trend widget | 121 |
| Customizing widgets | 123 |
| Portal integration | 123 |
| SolarWinds Orion server | 124 |
| OpenSocial portals | 125 |
| Microsoft SharePoint | 126 |
| Chapter 6: Business views | 127 |
| Trends | 127 |
| Trend operations | 128 |
| Creating trends | 128 |
| Data center visualizer | 130 |
| Historical performance analyzer charts | 131 |
| Capacity planning | 134 |
| Overlays | 134 |
| Chapter 7: Search | 136 |
| Searching for objects in Virtualization Manager | 137 |
| Search details | 138 |
| Search result actions | 139 |
| Search query actions | 139 |
| Search language | 140 |

| | |
|-----------------------------------|------------|
| Language syntax | 141 |
| Terms | 141 |
| Fields | 141 |
| Using wildcard searches | 141 |
| Using fuzzy searches | 142 |
| Using proximity searches | 142 |
| Using range searches | 143 |
| Using date searches | 143 |
| Boosting a term | 144 |
| Using Boolean operators | 144 |
| Grouping | 146 |
| Field grouping | 146 |
| Escaping special characters | 146 |
| Search query examples | 146 |
| Named fields | 148 |
| Example search queries | 149 |
| Using the query builder | 161 |
| Adding new filters | 161 |
| Common use cases | 162 |
| Chapter 8: Alerts | 167 |
| Scope | 168 |
| Criteria | 169 |
| Search result count | 169 |
| Attributes | 170 |
| Notifications | 172 |
| Using alert actions | 173 |

| | |
|---|------------|
| Example Action | 173 |
| SNMP settings | 176 |
| Advanced settings | 176 |
| Accessing historical alert information | 178 |
| Using the Time Travel tool | 178 |
| Viewing the history of an alert | 178 |
| Viewing alert information for a specific resource | 179 |
| Chapter 9: Capacity planning | 180 |
| Planning basics | 180 |
| Using resource containers | 180 |
| Using usage profiles | 183 |
| When will I run out? | 185 |
| How much more can I add? | 186 |
| Calculating VM sizes | 188 |
| What if I add more resources? | 189 |
| Overloaded hosts | 190 |
| Advanced options | 190 |
| Calculation settings | 191 |
| Resource types | 192 |
| Workload | 192 |
| Sample period | 192 |
| Showing the calculations and variables | 193 |
| Chapter 10: Configuration comparison | 194 |
| Using DNA comparison | 194 |
| Comparing an object to itself | 195 |
| Comparing two objects | 195 |

| | |
|--|------------|
| Using detailed comparison by category | 196 |
| Chapter 11: Dependency maps | 197 |
| Using the initial context | 197 |
| Setting context | 198 |
| Understanding alerts | 198 |
| Adding items to a chart | 198 |
| Exporting data | 199 |
| Adding items to a list | 199 |
| Sorting items | 199 |
| Using Time Travel | 199 |
| Chapter 12: Content | 201 |
| Editing content | 201 |
| Adding and removing content | 201 |
| Importing content | 202 |
| Exporting content | 202 |
| Content types | 202 |
| Tags | 204 |
| Modifying the tags of a piece of content | 204 |
| Removing tags from a piece of content | 204 |
| Creating custom tags | 204 |
| Owner and permissions | 205 |
| Chapter 13: Lists | 206 |
| Chapter 14: Reporting | 208 |
| Data exports | 208 |
| Generating exports | 208 |
| Generating exports from a search query | 209 |

| | |
|---|------------|
| On-demand reporting | 209 |
| Scheduled report jobs | 210 |
| Downloading reports | 211 |
| Configuring schedules | 211 |
| Removing report jobs | 212 |
| Pausing and resuming report jobs | 212 |
| Using custom reports | 212 |
| Chapter 15: Custom labels | 214 |
| Creating labels | 214 |
| Modifying labels | 214 |
| Removing labels | 215 |
| Chapter 16: Notes | 216 |
| Adding notes | 216 |
| Viewing notes | 216 |
| Chapter 17: Using the SolarWinds Integrated Virtual Infrastructure Monitor | 217 |
| Account limitations | 217 |
| Setting up user account limitations | 218 |
| Virtualization thresholds | 219 |
| Using baselining | 220 |
| Defining baselines | 221 |
| Understanding Object Statuses | 223 |
| vCenter | 225 |
| Datacenter | 225 |
| Cluster | 226 |
| Host | 226 |
| Virtual Machine | 228 |

| | |
|---|------------|
| AppStack Environment View and AppStack Environment resource | 229 |
| Creating virtualization alerts in the Orion Alert Manager | 229 |
| Creating virtualization reports in the Orion Report Manager | 230 |
| Viewing related entities in the Orion web console | 231 |
| Viewing storage infrastructure information in the Orion web console | 232 |
| Monitoring hardware health in IVIM | 233 |
| Chapter 18: Integrated Virtualization Infrastructure Monitor resources | 234 |
| Active Virtualization Alerts | 234 |
| Applications on this Datastore | 234 |
| Component Volumes | 235 |
| Datacenter Details | 235 |
| Datacenter Details view | 235 |
| Datacenters with Problems | 236 |
| Datastore Info | 236 |
| Datastore IOPS and Latency | 237 |
| Effective CPU Load | 237 |
| Effective Memory Load | 237 |
| ESX Host Details | 238 |
| Guests with Problems | 238 |
| Host Details view | 238 |
| Hosts with Problems | 239 |
| IOPS (Datastore and its Top VMs) | 239 |
| Latency (Datastore and its Top VMs) | 240 |
| Learn More about VMan Roles | 241 |
| List of Virtual Hosts | 241 |
| Overall Number of Running vs. Total VMs | 241 |

| | |
|--|-----|
| Percent Availability | 242 |
| Percent Memory Used | 242 |
| Predicted Datastore Space Depletion | 242 |
| Predicted VM Disk Depletion | 243 |
| Resource Utilization | 244 |
| Setup Virtualization Manager Integration | 245 |
| Storage Summary | 245 |
| Top Datastore I/O Latency | 246 |
| Top Datastore IOPS | 247 |
| Top VM IOPS | 248 |
| Top VM Latency | 248 |
| Top XX Datastores by Low Free Space | 249 |
| Top XX Hosts by CPU Load | 250 |
| Top XX Hosts by Network Utilization | 250 |
| Top XX Hosts by Number of Running VMs | 251 |
| Top XX Hosts by Percent Memory Used | 251 |
| Top XX Managed Virtual Guests by Current Response Time | 252 |
| Top XX Managed Virtual Guests by CPU | 252 |
| Top XX Managed Virtual Guests by Memory | 253 |
| Top XX Managed Virtual Guests by Network Utilization | 253 |
| Top XX Managed Virtual Guests by % Packet Loss | 254 |
| Top XX VMs by Allocated Space | 254 |
| Top XX VMs by Low Storage Space | 255 |
| Top XX VMs by Overallocated CPU | 256 |
| Top XX VMs by Overallocated Memory | 256 |
| Top XX VMs by Snapshot Disk Usage | 256 |

| | |
|--|-----|
| Top XX VMs by Storage Consumed | 257 |
| Top XX VMs by Underallocated CPU | 258 |
| Top XX VMs by Underallocated Memory | 258 |
| Top XX VMs by Used Space | 258 |
| Usage MHz | 259 |
| Virtual Cluster Details | 259 |
| Virtual Disks and Related Storage Infrastructure | 259 |
| Virtual Machine Details view | 260 |
| Virtual Machine IOPS | 260 |
| Virtual Machine IOPS and Latency | 260 |
| Virtual Machine Latency | 261 |
| Virtualization Assets | 261 |
| Virtualization Asset Summary | 262 |
| Overall | 262 |
| VMware | 262 |
| Hyper-V | 263 |
| Virtualization Manager Alerts | 263 |
| Virtualization Manager Tools | 264 |
| Modifying the permissions | 264 |
| Virtualization Storage Summary | 265 |
| Virtualization Volume Details | 266 |
| VMs Idle for the Last Week | 266 |
| VMs Powered Off for More Than 30 Days | 267 |
| VMs that might benefit from decreasing vCPUs | 267 |
| VMware vCenters with Problems | 267 |
| VMware Clusters with Problems | 268 |

| | |
|--|------------|
| Appendix A: Troubleshooting Hyper-V discovery | 269 |
| Why does Virtualization Manager not receive information from Hyper-V Hosts? | 269 |
| Testing local WMI services | 270 |
| Testing WMI on the target server | 270 |
| Resetting the WMI counters | 271 |
| Testing remote WMI connectivity | 272 |
| Remotely testing WMI on the target server | 272 |
| Verifying the administrator credentials | 273 |
| Enabling Remote Procedure Call (RPC) | 274 |
| Verifying the firewall settings | 276 |
| Adding the Windows Firewall snap-in | 276 |
| Enabling the core networking rules | 277 |
| Enabling the Windows Management Instrumentation (DCOM-In) rule | 277 |
| Creating a new firewall rule to open the RPC ports | 278 |
| Disabling ping discovery | 280 |
| Configuring Virtualization Manager to identify ESX hosts by name | 280 |
| Configuring Distributed Component Object Model (DCOM) and User Account Control (UAC) | 281 |
| Enabling DCOM | 282 |
| Enabling account privileges in WMI | 283 |
| Disabling remote User Account Control for workgroups | 284 |
| Verifying credentials in Virtualization Manager | 284 |
| Testing the connection between the Hyper-V host and Virtualization Manager | 285 |
| Adding a new discovery job | 285 |
| Running an existing discovery job | 286 |
| Appendix B: Using PowerCLI | 287 |

| | |
|--|------------|
| Installing PowerShell | 287 |
| Connecting to Virtualization Manager | 288 |
| Searching in Virtualization Manager | 288 |
| Using configuration item references | 289 |
| Working with the vSphere PowerCLI | 289 |
| Cmdlets and scripts | 289 |
| Scripts | 290 |
| Using cmdlets | 292 |
| Appendix C: Using Perl SDK | 305 |
| Module installations | 305 |
| Downloading the Perl Client | 305 |
| Using the Perl Client | 306 |
| Writing your first script | 306 |
| Scripting tips | 308 |
| Using the provided example | 308 |

SolarWinds Virtualization Manager Administrator Guide

About SolarWinds

SolarWinds, Inc. develops and markets an array of IT management, monitoring, and discovery tools to meet the diverse requirements of today's IT management and consulting professionals. SolarWinds products continue to set benchmarks for quality and performance and have positioned the company as the leader in IT management and discovery technology. The SolarWinds customer base includes over 85 percent of the Fortune 500 and customers from over 170 countries. Our global business partner distributor network exceeds 100 distributors and resellers.

Contacting SolarWinds

You can contact SolarWinds in a number of ways, including the following:

| Team | Contact Information |
|-------------------|---|
| Sales | 1.866.530.8100 http://www.solarwinds.com/ |
| Technical Support | http://www.solarwinds.com/support (you need a customer account to access the Customer Support area of the website.) |
| User Forums | http://www.thwack.com/ |

Conventions

The documentation uses consistent conventions to help you identify items throughout the printed and online library.

| Convention | Specifying |
|----------------------------------|---|
| Bold | Window items, including buttons and fields |
| <i>Italics</i> | Book and CD titles, variable names, new terms |
| <code>Fixed font</code> | File and directory names, commands and code examples, text typed by you |
| Straight brackets, as in [value] | Optional command parameters |
| Curly braces, as in {value} | Required command parameters |
| Logical OR, as in value1 value2 | Exclusive command parameters where only one of the options can be specified |

SolarWinds Virtualization Manager Documentation Library

The following documents are included in the SolarWinds Virtualization Manager documentation library:

| Document | Purpose |
|---------------------|---|
| Administrator Guide | Provides detailed setup, configuration, and conceptual information. |

| | |
|---------------|---|
| Release Notes | Provides late-breaking information, known issues, and updates. The latest Release Notes can be found at http://www.solarwinds.com . |
|---------------|---|

Helpful tips and tricks

- When you are building usage trends from scratch, you can base new trends on already existing ones. Choose a trend under **Explore > Content**, and then modify the evaluation criteria to suit your needs. For more information about creating trends, see [Creating trends](#).
- You can set up a default dashboard for users in order to control what information they have access to. For information about setting up default dashboards, see [Dashboard basics](#).
- To provide users with custom dashboards while preventing them from modifying dashboards, make the dashboards world readable only. For more information, see [Dashboards](#).
- If you do not need a particular alert but you think you might need it later, you can disable the alert instead of removing it completely. For information about disabling alerts, see [Alerts](#).
- You can build alerts based on complex search queries. For information about building and modifying search queries, see [Searching for objects in Virtualization Manager](#).



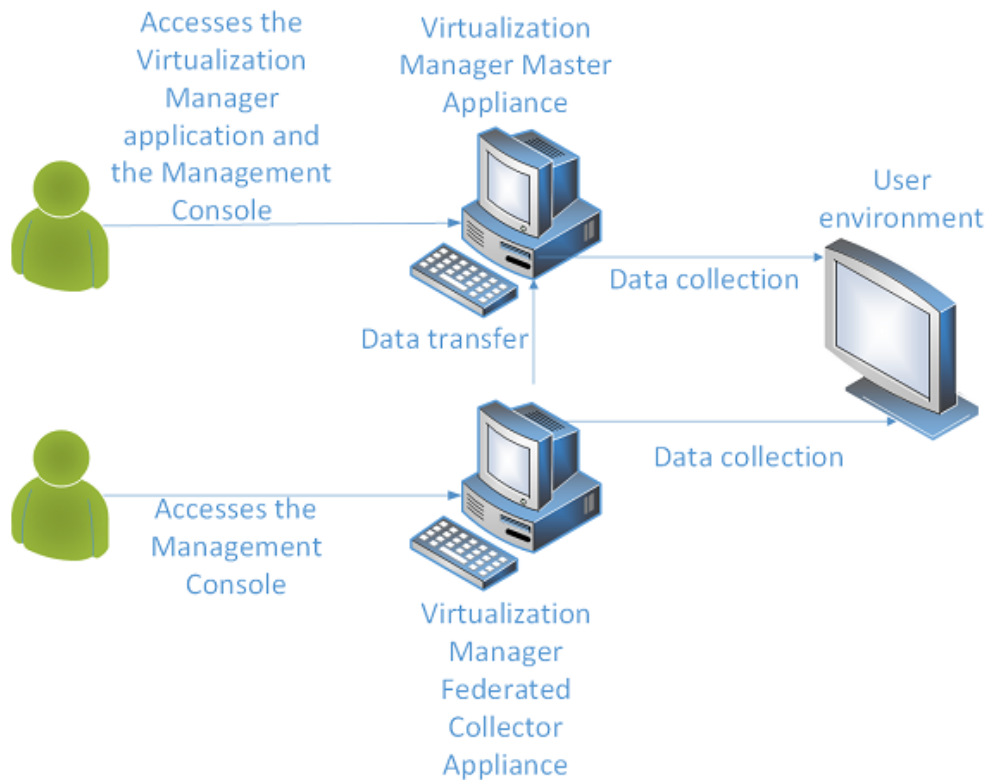
Chapter 1: Introduction

SolarWinds Virtualization Manager offers an easy-to-use, scalable virtualization management solution whose resources can also be integrated with other SolarWinds products on the Orion platform.

SolarWinds Virtualization Manager provides visibility into virtual machines and their support infrastructure. It acts as a single pane of glass through which virtual infrastructure administrators can view the internal configuration and state of the services that comprise the virtualized workloads running atop virtual infrastructure, along with the supporting computing environment to capture a holistic representation of the evolution and movement of VMs within the infrastructure.

In addition, real-time and historical information is aggregated within an advanced visualization interface to present a structured representation of previously unstructured uncorrelated data.

The following graphic provides a basic outline of the Virtualization Manager architecture.



Why install SolarWinds Virtualization Manager

SolarWinds Virtualization Manager includes the following features and fulfills the following objectives.

Search Oriented

Provides a search-based introspection of virtualized workloads and the underlying infrastructure that supports them. This holistic view crosses virtual and physical boundaries to consolidate disparate data sources. SolarWinds Virtualization Manager provides an improved management experience that facilitates the administration paradigms that organizations use to get the most out of their infrastructure.

Historical Insight

Provides a logical historical record of the entire virtual infrastructure environment to better support temporal-based life cycle management needs.

Multi-Discipline

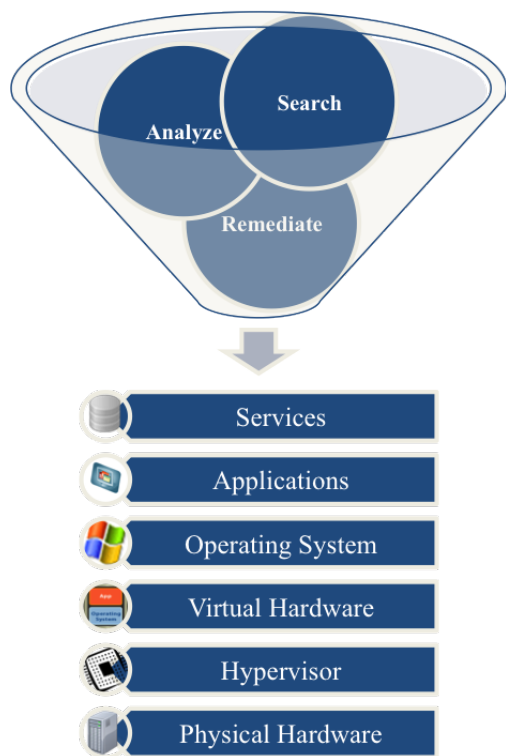
Facilitates broad problem isolation, forensics, performance management, and capacity and consolidation planning processes over the entire managed infrastructure.

Business Views

Applies analytics to show data center trends, performance correlations, and pie chart visualizations of your virtual infrastructure.

Actionable Interface

Provides an actionable interface to all of the information sources to support remediation-based administration models.



Key features of SolarWinds Virtualization Manager

SolarWinds Virtualization Manager provides the following features to help you manage your virtual infrastructure:

- Real-time dashboards for forecasting, detecting, and troubleshooting capacity bottlenecks
- Integrated capacity planning for VMware and Microsoft Hyper-V
- Integration with SolarWinds Server & Application Monitor (SAM) and Orion Network Performance Monitor (NPM)
- Performance monitoring
- Chargeback and showback automation
- Virtualization configuration management
- Virtualization dashboards
- Performance alerts
- Performance monitoring and management



Chapter 2: Installing SolarWinds Virtualization Manager

This topic contains information about the installation and uninstallation procedures for SolarWinds Virtualization Manager. The information is organized into the following sections:

- [Minimum requirements](#)
- [Installing Virtualization Manager as a virtual appliance](#)
- [Installing the Integrated Virtual Infrastructure Monitor \(IVIM\)](#)
- [Upgrading an existing virtual appliance](#)
- [Updating an existing Windows installation](#)
- [Migrating from an existing virtual appliance to a new virtual appliance](#)
- [Installing, updating and uninstalling a federated collector](#)
- [Licensing](#)

Minimum requirements

This section provides information about software and hardware requirements. Before you proceed with the installation procedures, make sure your hardware and software meet the following minimum requirements.

Browser requirements

SolarWinds Virtualization Manager is a web-based product that has the following browser requirements.

| Software | Requirements |
|--------------------|--|
| Supported browsers | Internet Explorer 8 or later Mozilla Firefox 3.5 or later Google Chrome 8 or later |
| Adobe Flash | Adobe Flash Player 9 or later |

Virtual appliance requirements

The following table contains the virtual appliance requirements for SolarWinds Virtualization Manager.

| Software or hardware | Requirements |
|-------------------------|--|
| Virtualization software | <p>VMware vSphere 4.1 or later</p> <p>VMware ESX or ESXi 4.1 or later</p> <p>Microsoft Hyper-V Server 2008 R2</p> <p>Microsoft Hyper-V Server 2012</p> <p>Microsoft Hyper-V Server 2012 R2***</p> <p>Note: Virtualization Manager only supports the default, English localization of Hyper-V.</p> <p>***With this software Virtualization Manager does not support the following counters:</p> <ul style="list-style-type: none">• vm.processorSocketCount (as a result of the missing ProcessorsPerSocket property in the Msvm_ProcessorSettingData class)• vm.processorCoresPerSocket (as a result of the missing SocketCount property in the Msvm_ProcessorSettingData class) |

| Software or hardware | Requirements |
|----------------------|---|
| | <ul style="list-style-type: none"> • vm.processorCount (as a result of the previous two missing properties) • host.vSwitch.maxChimneyOffloads (as a result of the missing MaxChimneyOffloads property in the Msvm_VirtualSwitch class) • host.vSwitch.numLearnableAddresses (as a result of the missing NumLearnableAddresses property in the Msvm_VirtualSwitch class) • host.vSwitch.port.accessVlan (as a result of the missing AccessVLAN property in the Msvm_VLANEndpointSettingData class) • host.vSwitch.port.defaultVLAN (as a result of the missing DefaultVLAN property in the Msvm_VLANEndpointSettingData class) • host.vSwitch.port.nativeVLAN (as a result of the missing NativeVLAN property in the Msvm_VLANEndpointSettingData class) <p>The following are class replacements for configuration and performance collections against 2012 R2 servers:</p> <ul style="list-style-type: none"> • Msvm_SwitchLANEndpoint class replaced by Msvm_LANEndpoint • Msvm_VirtualSwitch class replaced by Msvm_VirtualEthernetSwitch • Msvm_VmLANEndpoint class replaced by Msvm_ |

| Software or hardware | Requirements |
|----------------------|---|
| | <p>LANEndpoint</p> <ul style="list-style-type: none">• Msvm_SwitchPort class replaced by Msvm_EthernetSwitchPort• Msvm_VLANEndpointSettingData class replaced by Msvm_EthernetSwitchPortVlanSettingData• Msvm_ResourceAllocationSettingData class replaced by Msvm_StorageAllocationSettingData |
| CPU | 2 GHz quad-core |
| Virtual CPUs | 4 vCPUs |
| Memory | 8 GB or more (For more information, see Memory requirements.) |
| Disk space | 200 GB or more (For more information, see Disk space requirements.) |
| Virtual NIC | 1 Gigabit vNIC |

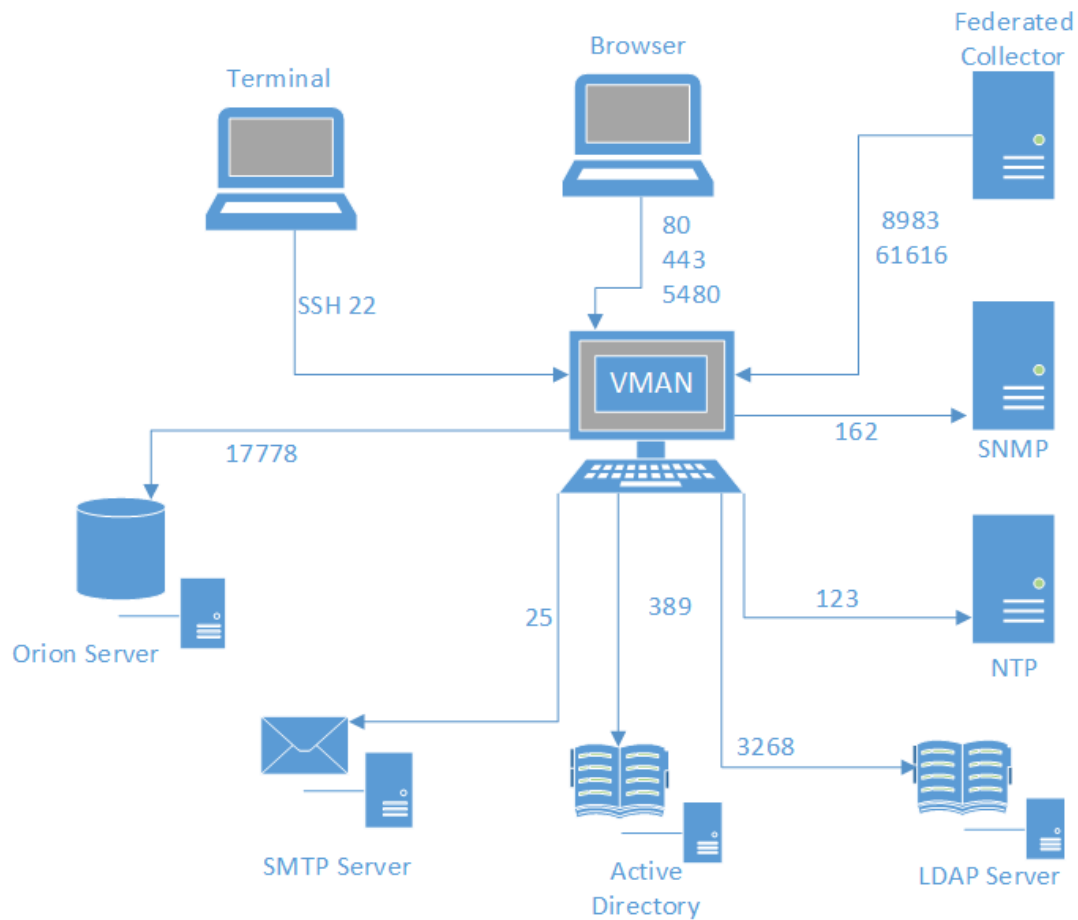
Port requirements

The port requirements of SolarWinds Virtualization Manager depend on the features and components that you use. The features and components on which the port requirements depend are the following:

- VMware data collection
- Hyper-V data collection
- AD/LDAP authentication
- Sending email notifications (used in alerting and reporting)
- Sending SNMP traps (used in alerting)

- Orion integration
- Federated collectors

Master appliance



Configure the following inbound ports for communication with the Virtualization Manager master appliance.

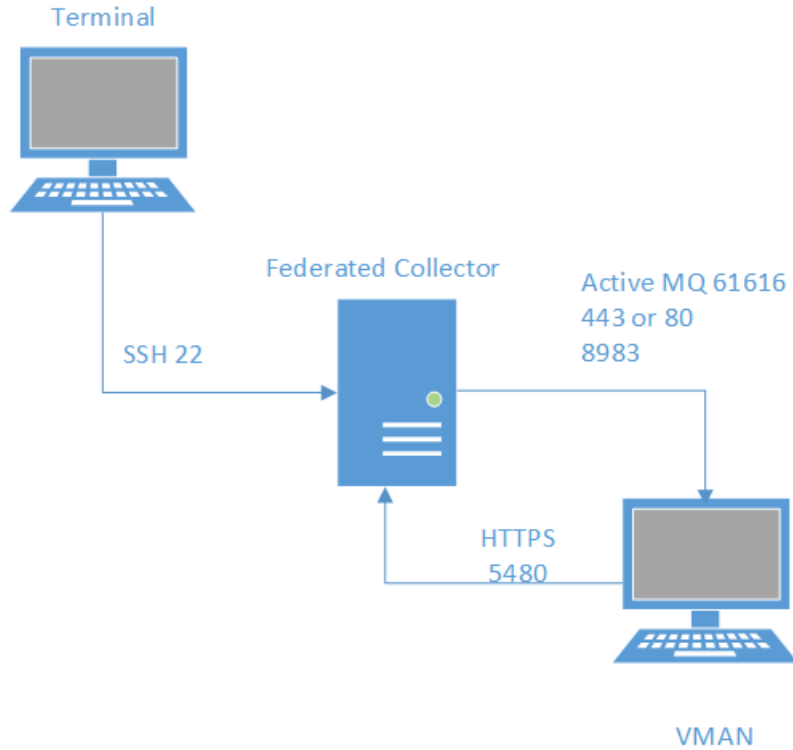
| Port | Usage |
|-----------|---|
| 443 or 80 | Performing auto-upgrade or version upgrade on federated collectors, if federated collectors are configured. |

| Port | Usage |
|-------|--|
| 8983 | Access from federated collectors to the master appliance during initial setup. |
| 443 | HTTPS access to the Virtualization Manager user interface. |
| 5480 | HTTPS access to the Management Console. |
| 61616 | For Active MQ master-collector communication. |
| 22 | SSH access to the virtual appliance. |

Configure the following outbound ports, depending on the individual setup and the functions you use.

| Port | Usage |
|-------|--|
| 162 | Sending SNMP traps. |
| 25 | Sending emails through SMTP. |
| 389 | Active Directory authentication. |
| 3268 | LDAP authentication. |
| 17778 | Communication with the SolarWinds Orion server if the integration with Orion is enabled. |
| 123 | Using the NTP service. |

Federated collector



Configure the following inbound ports on the federated collector.

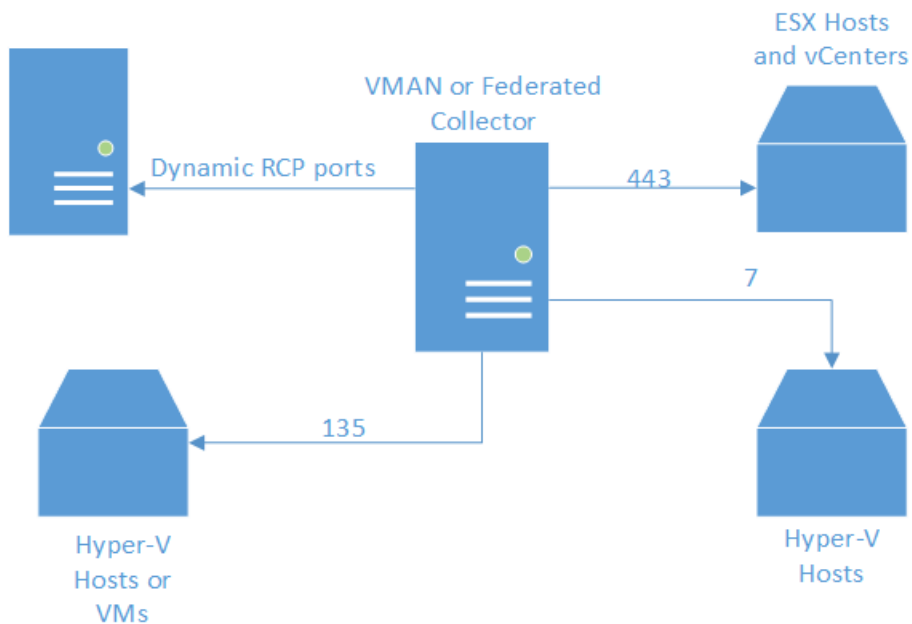
| Port | Usage |
|------|--|
| 5480 | HTTPS access to the federated collector. |
| 22 | SSH access to the federated collector. |

Configure the following outbound ports on the federated collector.

| Port | Usage |
|-----------|---|
| 61616 | Active MQ master-collector communication. |
| 443 or 80 | Performing auto-upgrade or version upgrade. |

| Port | Usage |
|------|--|
| 8983 | Access from federated collectors to the master appliance during initial setup. |

Data collection



Depending on the environment you poll, configure the following outbound ports on the master or the collector for data collection.

| Port | Usage |
|-------------------|--|
| 443 | Data collection from ESX hosts and vCenters. |
| 7 | Access to Hyper-V hosts that were added by using a fully qualified domain name. |
| 135 | WMI data collection from Hyper-V hosts or VMs. |
| Dynamic RCP ports | WMI communication. You can configure the available ports on the WMI target/policy. |

Memory requirements

SolarWinds Virtualization Manager has the following memory requirements based on the number of hosts and VMs.

| Number of ESX hosts | Number of VMs | Memory |
|---------------------|---------------|-----------------|
| 100 | 1000 | 8 GB |
| 125 | 1250 | 10 GB |
| 150 | 1500 | 12 GB |
| 175 | 1750 | 14 GB |
| 200 | 2000 | 16 GB |
| 200 < | 2000 < | Contact Support |

The minimum memory requirement is 8 GB, but your deployment may require more to handle peak memory demands. If certain conditions are met, you can reduce the memory requirement for collecting from multiple vCenters (VC) in the following ways:

- Schedule the configuration data collection jobs for the different VCs to be certain they do not overlap, by setting the start times at least 3 hours apart. This necessitates reducing the frequency of configuration collection to 1-2 times per day.
- Instead of using the actual total number of ESX hosts in the environment, calculate a "proxy number of hosts" by using the following formula:
 - Take the largest number of hosts managed by a single VC instance.
 - Add 15% for each additional VC in your environment, regardless of its size.

For example, if you have three VCs and the largest VC manages 90 hosts, then your "proxy number of hosts" is 117.

$$117 = 90 + 0.15 \times 90 + 0.15 \times 90$$

The number of ESX hosts above is guidance only, and is based on a typical corporate IT virtualization environment with approximately 10 VMs and one datastore per ESX host server. Higher density environments require larger memory sizes.

Disk space requirements

At least 200 GB of disk space is recommended so that you do not run out of storage too soon. At the default collection interval, a virtualized environment containing 1000 VMs and 100 hosts typically requires 40 GB of storage during the first month, and then an additional 60 GB of storage over the next five years.

To more accurately estimate the disk space you will require over time, download the [SolarWinds Virtualization Manager Storage Calculator](#).

Expanding the provisioned disk size

The VMware appliance may allow thin provisioning as an option to let you install with less than 200 GB of free disk space, but you will eventually exhaust the available space. SolarWinds Virtualization Manager stops collecting data when less than 1 GB of storage remains. At that point, you must increase the available storage, and then change the provisioned size or the virtual hard disk.

To expand the provisioned size:

1. Increase the provisioned size of Hard disk 2 of the appliance.
 - a. Run the vSphere client, and then connect to the vCenter that is hosting the appliance.
 - b. Select the SolarWinds Virtualization Manager appliance from the list on the left.
 - c. Click **Inventory > Virtual Machine > Edit Settings**.
 - d. Select **Hard disk 2** from the Hardware list.

- e. Increase the **Provisioned Size** to the size you want.
- f. Click **OK**.

2. Restart the appliance virtual machine.

To expand the disk on Microsoft Hyper-V, contact [SolarWinds Technical Support](#).

VMware account permissions

SolarWinds Virtualization Manager can collect data from a VMware environment with any combination of the following:

- VMware vSphere 4.1+
- VMware ESX or ESXi 4.1+ managed or unmanaged hosts

The VMware user account used for data collection must have at least Read-Only permissions for the host and VMs you want to monitor.

To collect information about data stores, the account must also have the Browse Datastore permission.

SolarWinds Integrated Virtual Infrastructure Monitor Requirements

The following table lists the minimum software requirements and recommendations for a SolarWinds Integrated Virtual Infrastructure Monitor installation.

| Software/Hardware | Requirement |
|-------------------|--|
| Operating System | <p>Windows Server 2003 R2 SP2 (32-bit and 64-bit)</p> <p>Windows Server 2008, 2008 SP2, 2008 R2 and 2008 R2 SP1</p> <p>Windows Server 2012, 2012 R2</p> <p>The following operating systems are supported for</p> |

| Software/Hardware | Requirement |
|-------------------|---|
| | evaluation purposes only: Windows 7 Windows 7 SP1 Windows 8 (except Standard edition) Windows 8.1 (except Standard edition) Windows 8.1 Update 1 (except Standard edition) |
| CPU | 3.0 GHz |
| RAM | 8 GB |
| HDD | 20 GB |
| .NET Framework | 3.5 SP1, 4.0.3 |
| SQL Server | SQL Server 2008 without SP SQL Server 2008 SP1, SP2, SP3 SQL Server 2012 SQL Server 2012 SP1 SQL Server 2014 |
| Browser | Internet Explorer version 8 or later Mozilla Firefox two latest versions Google Chrome two latest versions |

Installing Virtualization Manager as a virtual appliance

This topic outlines the installation and uninstallation of SolarWinds Virtualization Manager as a virtual appliance. The interfaces described are a representation of

the screens available within the vSphere, or Hyper-V client, but can differ slightly based on version.

The SolarWinds Virtualization Manager appliance is available in two versions:

.ova file

for use with vSphere 4.1 and higher

Hyper-V .zip file

for use with Hyper-V server

The following sections describe the typical installation steps and requirements for different versions of the virtual appliance.

- [Installing Virtualization Manager on VMware vSphere 4.1 or later](#)
- [Installing Virtualization Manager on Microsoft Hyper-V Server 2008](#)
- [Installing Virtualization Manager on Microsoft Hyper-V Server 2012](#)

Installing Virtualization Manager on VMware vSphere 4.1 or later

Complete the following procedure to install Virtualization Manager on VMware vSphere 4.1 or later.

1. Extract the contents of the VSphere .zip file.
2. Run the VMware vSphere Client, and then log on with administrator privileges.
3. Click **File > Deploy OVF Template**.
4. Click **Browse** to select the .ova file you extracted, and then click **Next**.
5. Click **Next** again.
6. Type a name for the virtual appliance, select a location for it in the Inventory panel, and then click **Next**.
7. Select a resource pool, and then click **Next**.
8. Select either **Thin-provisioned format** or **Thick provisioned format**, and then click **Next**.

Note: Thin provisioning lets you install with less than 100 GB of disk space

free, but you will eventually exhaust this. For more information, see [Disk space requirements](#).

9. Select a network, and then click **Next**.
10. To use DHCP to determine the IP address of the appliance, click **DHCP**, and then click **Next**.
11. To use a fixed IP address from the network pool, follow these steps:
 - a. Click **Fixed**, and then click **Next**.
 - b. Enter the fixed IP to reserve for the appliance, and then click **Next**.
12. Click **Finish**.
13. Open a browser to `https://IPAddress:5480` where `IPAddress` is the address of the virtual appliance server.
14. Log in, and then accept the End User License Agreement. The default account is `admin` with the password `admin`.
15. Click **Network**, and then click **Address**.
16. If you use DHCP to determine the IP address of the appliance, verify that it is selected.
17. If you use a static IP address, complete the following steps:
 - a. Enter the static IP of the virtual appliance.
 - b. Enter the net mask.
 - c. Enter the gateway.
 - d. Enter the DNS Server 1.
 - e. Enter the DNS Server 2.
 - f. Enter a host name to use for the virtual appliance.
 - g. Click **Save Settings**.
18. Click **Proxy** and enter proxy server information if necessary, and then click **Save Settings**.

Installing Virtualization Manager on Microsoft Hyper-V Server 2008

This topic outlines the installation of SolarWinds Virtualization Manager as a Microsoft Hyper-V virtual appliance on Windows Server 2008. The interfaces described are a representation of the screens available within the Hyper-V Manager, but can differ slightly based on version. The Windows server must already be configured as described in [Minimum requirements](#).

Complete the following procedure to install Virtualization Manager on Microsoft Hyper-V Server 2008.

1. Extract the contents of the Hyper-V .zip file to a permanent location.
Note: After the virtual machine is imported, the location of the extracted files cannot be changed.
2. Launch the Hyper-V Manager.
3. Connect to the appropriate Hyper-V server.
4. In the **Action** menu, select **Import Virtual Machine**.
5. Click **Browse** to select the folder of the extracted .zip file. By default, it is `Virtualization-Manager-HyperV-version`.
6. Select **Copy the virtual machine**.
7. Click **Import**.
8. Right-click the virtual appliance, and then select **Settings**.
9. Select **Network Adapter**.
Note: Using a Legacy Network Adapter may cause degradation in network connection: the web application might become inaccessible or the SSH connection may break down. To verify that your network adapter is working correctly, connect to the Virtualization Manager appliance by using the Hyper-V Manager, and then run the `ifconfig` command. If the output of the command shows that there are no dropped packets, the network adapter is working correctly.
10. Specify the network settings the VM should use.

11. Click **OK**.
12. Start the VM.
13. Right-click the virtual appliance in the inventory, and then click **Connect**.
14. Select **Set Timezone** and ensure that the appliance is set to the same time zone as the Hyper-V host server.
15. Use the arrow keys to select **Configure Network**, and then press enter.
16. If you use DHCP to determine the IP address of the appliance, type 'y' when prompted with the "Use a DHCP Server instead of a static IP address?" question.
17. If you use a static IP address, complete the following steps:
 - a. Type 'n' when prompted with the "Use a DHCP Server instead of a static IP address?" question.
 - b. Enter the static IP of the virtual appliance.
 - c. Enter the net mask.
 - d. Enter the gateway.
 - e. Enter the DNS Server 1.
 - f. Enter the DNS Server 2.
 - g. Enter a host name to use for the virtual appliance.
18. Enter proxy server information if necessary.
19. Type 'y' when prompted with the "Is this correct?" question.
20. Open a browser to `http://IPaddress`, where IPaddress is the address shown in the console.
21. Log in, and then accept the End User License Agreement. The default account is `admin` with the password `admin`.

Installing Virtualization Manager on Microsoft Hyper-V Server 2012

This topic outlines the installation of SolarWinds Virtualization Manager as a Microsoft Hyper-V virtual appliance on Windows Server 2012. The interfaces described are a representation of the screens available within the Hyper-V Manager, but can differ slightly based on version. The Windows server must already be configured as described in [Minimum requirements](#).

Complete the following procedure to install Virtualization Manager on Microsoft Hyper-V Server 2012.

1. Extract the contents of the Hyper-V .zip file.
2. Launch the Hyper-V Manager.
3. Connect to the appropriate Hyper-V server.
4. In the **Action** menu, select **Import Virtual Machine**.
5. If this is the first time you have imported a virtual machine, or if you have not dismissed the **Before You Begin** screen, click **Next**.
6. Click **Browse** to select the folder of the extracted .zip file. By default, it is `Virtualization-Manager-HyperV-version`.
7. Click **Next**.
8. Select "Virtualization-Manager" on the import screen.
9. Select **Copy the virtual machine (create a new unique ID)**, and then click **Next**.
10. To install the VM files in the default location, click **Next**.
11. To install the VM files in a different location, select **Store the virtual machine in a different location**, and then click **Browse** to change folders. Click **Next**.
12. Click **Browse** to choose where you want to store the virtual machine files, and then click **Next**.
13. Review your selections, and then click **Finish**.

14. Right-click the virtual appliance, and then select **Settings**.
15. Select **Network Adapter**.

Note: Using a Legacy Network Adapter may cause degradation in network connection: the web application might become inaccessible or the SSH connection may break down. To verify that your network adapter is working correctly, connect to the Virtualization Manager appliance by using the Hyper-V Manager, and then run the `ifconfig` command. If the output of the command shows that there are no dropped packets, the network adapter is working correctly.
16. Specify the network settings the VM should use.
17. Click **OK**.
18. Start the VM.
19. Right-click the virtual appliance in the inventory, and then click **Connect**.
20. Select **Set Timezone** and ensure that the appliance is set to the same time zone as the Hyper-V host server.
21. Open a browser to `https://IPAddress:5480` where `IPAddress` is the address of the virtual appliance server.
22. Log in, and then accept the End User License Agreement. The default account is `admin` with the password `admin`.
23. Click **Network**, and then click **Address**.
24. If you use DHCP to determine the IP address of the appliance, verify that it is selected.
25. If you use a static IP address, complete the following steps:
 - a. Enter the static IP of the virtual appliance.
 - b. Enter the net mask.
 - c. Enter the gateway.
 - d. Enter the DNS Server 1.

- e. Enter the DNS Server 2.
 - f. Enter a host name to use for the virtual appliance.
 - g. Click **Save Settings**.
26. Click **Proxy** and enter proxy server information if necessary, and then click **Save Settings**.

Uninstalling Virtualization Manager

This topic outlines the uninstallation procedure of Virtualization Manager.

Warning: The deletion is irreversible. Deleting the master appliance also deletes the database. If you want to keep your database for later use, do not delete the appliance.

To uninstall a Virtualization Manager appliance:

1. If you have Virtualization Manager integrated with the SolarWinds Orion server, open the Settings page of the Orion web console.
2. In the **Settings** grouping, click **Virtualization Settings**.
3. Click **Setup Virtualization Manager integration**.
4. Select **Disable Integration**.
5. After the integration with the SolarWinds Orion server is removed, turn off, and then delete the federated collectors and the master appliance.

For information about uninstalling federated collectors, see [Uninstalling a federated collector](#).

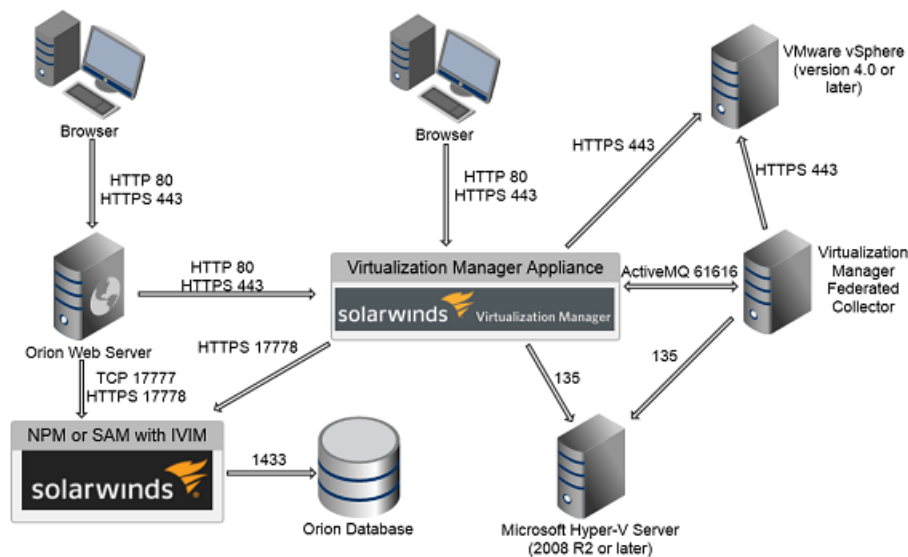
Installing the Integrated Virtual Infrastructure Monitor (IVIM)

SolarWinds Virtualization Manager uses the Integrated Virtual Infrastructure Monitor (IVIM) to integrate some Virtualization Manager resources into the Orion

Chapter 2: Installing SolarWinds Virtualization Manager

Web Console for SolarWinds Network Performance Monitor (NPM) or SolarWinds Server and Application Monitor (SAM).

The following graphic shows the ports that are required for the integration to work properly.



Preparing for the integration of Virtualization Manager

Orion platform products poll for managed nodes to update status information. Depending on your polling method and Virtualization Manager environment, you may get different results. Use the following table to determine how to modify your current VMware and Hyper-V environments so that they integrate smoothly with your Orion platform product.

| Orion polling method | VMware (Host) | Hyper-V (Host) | VMware (Guest) | Hyper-V (Guest) |
|----------------------|---------------|----------------|----------------|-----------------|
| No Status | Yes | No | Yes | Yes |
| ICMP | Yes | No | Yes | Yes |
| WMI/ICMP | N/A | Yes | Yes | Yes |
| SNMP/ICMP | Yes | No | Yes | Yes |

Integrating Virtualization Manager for a VMware environment

In getting Virtualization Manager data for a specific virtual machine, IVIM presents Virtualization Manager with an identifier, asking for the virtual machine that matches. The identifier of IVIM is different from the identifier of Virtualization Manager.

In order to display Virtualization Manager data of a specific configuration item (for example, a virtual machine) VIM polls Virtualization Manager for virtual machine equals. IVIM and Virtualization Manager both use different types of identifiers for the configuration items. To make sure that the different types of identifiers are matched correctly, it is best practice in a VMware environment to always poll against the vCenter, instead of polling directly against the hosts.

IVIM polls against the vCenter (VMware) server, not against ESX servers on which virtual machines run. IVIM also provides a functionality that allows vCenter monitoring using CIM (Common Information Model). This functionality makes it possible for SAM and NPM to get a token from the vCenter instead of using the credentials for the hosts, and use CIM to collect data even if you poll against the vCenter, and not against the hosts.

Note: Neither SAM, nor NPM uses this functionality currently.

One Virtualization Manager installation can integrate with **one** Orion platform product installation. If you want to integrate Virtualization Manager with a different Orion platform product, then you must first remove any current integration in Orion, under **Settings > Virtualization Manager > Setup Virtualization Manager Integration**.

This section assumes the following:

- You have already completed the installation and setup process of Virtualization Manager.
- You are ready to integrate your existing Virtualization Manager instance with NPM or SAM.
- You have a licensed and supported version of NPM or SAM installed on the server where you want to integrate Virtualization Manager.

For information about installing NPM, see the [SolarWinds Network Performance Monitor Administrator Guide](#). For information about installing SAM, see the [SolarWinds Server and Application Manager Administrator Guide](#).

Note: If you do not have NPM or SAM installed, you can integrate IVIM with your Virtualization Manager instance. For information about installing and integrating IVIM with Virtualization Manager, see [Installing the SolarWinds Integrated Virtual Infrastructure Monitor in standalone mode](#).

To integrate Virtualization Manager with a compatible SolarWinds product:

1. On the server where your compatible SolarWinds product is installed, launch the SolarWinds IVIM installer.
 - a. Type **YES** to indicate that you are aware of the recommendation to back up your existing Orion product database before installing the Virtualization Manager integration.
 - b. Click to accept the License Agreement.
 - c. Allow the installer to copy files, and then click through the remaining prompts. The configuration wizard starts after the installation is finished.
 - d. Adjust the database and database server as the targets for adding modules if they are not your current Orion product database and database server.
 - e. Accept the default (All Unassigned Ports) as the target for adding website modules.
 - f. Accept the Service Settings (VIM Collector Plugin, VIM Job Engine Plugin).
 - g. Choose to launch the Orion Web Console, and then log in.
2. Navigate to **Settings > Discovery Central** if logging into the console does not automatically land you there.

3. Under Virtualization Discovery, click **Discover My Network**, and then complete the wizard.
4. Click **Settings > Virtualization Settings**.
5. Click **Setup Virtualization Manager Integration**.
6. Enter the appropriate information about your Virtualization Manager instance.
 - a. Enter the host name or IP address of the Virtualization Manager server.

Note: To access the network settings for the Virtualization Manager appliance server, use a browser to navigate to `https://ip_address:5480`. From this page you can review and adjust network settings, including the interface on the server through which Virtualization Manager communicates, the use of a static IP address instead of DHCP (default), the use of a proxy server, and the primary and secondary DNS servers.
 - b. Enter the port number on which Virtualization Manager expects to service web requests. The default port is 443.
 - c. Enter the user name and password with which you can access the Virtualization Manager web console.
7. Click **Submit**.

Installing the SolarWinds Integrated Virtual Infrastructure Monitor in standalone mode

Before installing the SolarWinds Integrated Virtual Infrastructure Monitor, make sure that your computer meets the system requirements. For more information, see [SolarWinds Integrated Virtual Infrastructure Monitor Requirements](#).

To install the SolarWinds Integrated Virtual Infrastructure Monitor in standalone mode:

1. Log on as an administrator to the SolarWinds server on which you want to install the SolarWinds Integrated Virtual Infrastructure Monitor.
2. Launch the executable file.
 - If you downloaded the product from the SolarWinds website, navigate to the download location, and then launch the executable file. You may need to run the file as an administrator.
 - If you received physical media, browse to the executable file, and then launch the executable file. You may need to run the file as an administrator.
3. If you are prompted to install any required components, such as Microsoft .NET Framework, click **Install**, and then complete the component installation, including a reboot, if required.

Notes:

- Downloading and installing Microsoft .NET Framework may take more than 20 minutes, depending on your existing system configuration.
 - If a reboot is required, click **Install** after restarting the computer to resume the installation.
4. Review the Welcome text. To use the SolarWinds Improvement Program to send anonymous data about your application usage, select **Send usage statistics**, and then click **Next**.
 5. Select your preferred language, and then click **Next**.
 6. If another SolarWinds Orion product is already installed, type `YES` to indicate that you are aware of the recommendation to back up your existing Orion product database before installing the SolarWinds Integrated Virtual Infrastructure Monitor, and then click **Next**.
 7. Accept the license agreement, and then click **Next**.

8. Select the file system folder where you want to install SolarWinds Integrated Virtual Infrastructure Monitor, and then click **Next**.
9. Click **Next** on the Start Copying Files window.
10. Click **Finish** to close the installation wizard.
11. The SolarWinds Configuration Wizard is launched automatically. Click **Next** on the Welcome window to continue the basic configuration. For more information about completing the configuration wizard, see the [SolarWinds Network Performance Monitor Administrator Guide](#).

Integrating IVIM with Virtualization Manager

After finishing the configuration of the Integrated Virtual Infrastructure Monitor, log in to the Orion web console. You will be prompted to integrate IVIM with Virtualization Manager.

To perform the integration, complete the following steps:

1. Enter the appropriate information about your Virtualization Manager instance.
 - a. Enter the host name or IP address of the Virtualization Manager server.

Note: To access the network settings for the Virtualization Manager appliance server, use a browser to navigate to `https://ip_address:5480`. From this page you can review and adjust network settings, including the interface on the server through which Virtualization Manager communicates, the use of a static IP address instead of DHCP (default), the use of a proxy server, and the primary and secondary DNS servers.
 - b. Enter the port number on which Virtualization Manager expects to service web requests. The default port is 443.
 - c. Enter the credentials of the administrator user with which you can access the Virtualization Manager web console.

2. Click **Submit**.

Possible issues during integration

During the integration process of Virtualization Manager and the SolarWinds Orion server, both applications keep running, and changes may occur in both environments, for example, nodes or data sources can be added or deleted. In these cases, it may happen that the data collected at the beginning of the synchronization process is no longer valid. The majority of these issues can be solved by resetting the integration process, and running the Synchronization Wizard again.

The following sections list the errors that may occur during the integration process of Virtualization Manager and the SolarWinds Orion server, and provide explanations and possible solutions.

Issues with credentials

| Error message | Explanation |
|--|---|
| Could not use credentials from Virtualization Manager/Orion. Incorrect integration data in Virtualization Manager/Orion. Reset Virtualization Manager integration and go through the Synchronization Wizard again. | If there is a change in Virtualization Manager or in the SolarWinds Orion server during the integration process, the integration data becomes invalid. Reset the integration process to load valid data. If the issue persists, check the error log for more information. |
| Could not use credentials from Virtualization Manager/Orion. Reset Virtualization Manager integration and go through the Synchronization Wizard again. If this error persists, check the error log for more information. | There is inconsistency in the database. Data related to processed nodes is missing. Use the Database Maintenance tool to clean up the database, and then reset the integration process. |

Issues with importing nodes to the SolarWinds Orion server

| Error message | Explanation |
|--|---|
| Could not use credentials from Virtualization Manager/Orion. | This message indicates a general error. Check the error log for more information. |

Issues with importing nodes to the SolarWinds Orion server

| Error message | Explanation |
|---|---|
| Could not import node to Orion. A node with the same name or IP address exists in the Orion database. Could not connect to this host by the given IP address. | A node with the same IP address exists in the SolarWinds Orion database, but it was not properly mapped to the existing node in Virtualization Manager. The IP address of the node was probed unsuccessfully. Check the node, and then start the polling manually. After the polling is finished, run the Synchronization Wizard again. |
| Could not import node to Orion. | This message indicates a general error. Check the error log for more information. |

Issues with changing the polling source

| Error message | Explanation |
|--|---|
| Could not change Polling source to Virtualization Manager/Orion. Incorrect integration data in Virtualization Manager. Reset Virtualization Manager integration and go through the Synchronization Wizard again. | If there is a change in Virtualization Manager or in the SolarWinds Orion server during the integration process, the integration data becomes invalid. Reset the integration process to load valid data. If the issue persists, check the error log for more information. |
| Could not change Polling source to Virtualization Manager/Orion. | This message indicates a general error. Check the error log for more information. |

| Error message | Explanation |
|---|---|
| Reconfiguring node to poll from parent Virtual Center failed. | If there is a change in Virtualization Manager or in the SolarWinds Orion server during the integration process, the integration data becomes invalid. Reset the integration process to load valid data. If the issue persists, check the error log for more information. |

Issues with sending data to Virtualization Manager

| Error message | Explanation |
|--|--|
| Sending integration data to Virtualization Manager failed. Reset Virtualization Manager integration and go through the Synchronization Wizard again. | The integration data collected in the SolarWinds Orion server during the synchronization process was sent to Virtualization Manager, but the communication between the SolarWinds Orion server and Virtualization Manager failed. Reset the integration process to load valid data. If the issue persists, check the error log for more information. |

Issues with the probe job

| Error message | Explanation |
|---|---|
| Could not connect to node [NAME] ([IP address]) using credential '[Credential name]'. | This is an informational message that indicates that the connection to the IP address is successful, but the credential is invalid. The node will be added to the SolarWinds Orion server, but you should verify the node and its credential. |
| Could not connect | The connection to the IP address is unsuccessful. The |

| Error message | Explanation |
|---|--|
| to node [NAME] ([IP_ADDRESS]). + ERROR MESSAGE | error message returned by the Probe job provides more details. |

Managing nodes in the Orion Web Console

If you manage a node in the Orion Web Console as an addition to managing it in Virtualization Manager, you can make use of the following features:

- The ability to monitor CPU, Memory, Virtual Memory, Response Time, and Latency.
- The ability to assign Custom Properties to nodes.

Depending on the other Orion platform products you own, you can get access to further resources.

If you use both SolarWinds Orion Network Performance Monitor and Virtualization Manager, and manage a node in the Orion Web Console, you can do the following:

- Apply Universal Device Pollers.
- Use Device Kits (with NPM v10.7).
- Pull routing table information.

If you use both SolarWinds Server and Application Monitor and Virtualization Manager, and manage a node in the Orion Web Console, you can do the following:

- Poll the server hardware health of the ESX hosts.
- Gather asset inventory data for virtual machines and ESX hosts.
- Reboot the server directly from within the Orion Web Console.

- Leverage the Real-Time Event Log Viewer, the Real-Time Process Explorer, and the Service Control Manager.
- Use network interface monitoring (for Windows only).

Upgrading an existing virtual appliance

To upgrade from Virtualization Manager 5.x to 6.x, you must first upgrade to Virtualization Manager 5.1.1, and then upgrade to 6.x from that version.

The following sections provide information about upgrading in different environments, and about the additional steps that are necessary after the upgrade.

- [Upgrading on vSphere 4.1 or later](#)
- [Upgrading on Hyper-V](#)
- [Additional upgrade steps for AD/LDAP authentication](#)
- [Activating the license](#)

Upgrading on vSphere 4.1 or later

The appliance upgrade comes as an .iso file for use with the vSphere or vCenter client.

To upgrade Virtualization Manager on vSphere 4.1 or later, complete the following steps:

1. Save the .iso file to the computer you use to access the vSphere client.
2. Run the vSphere Client, and then log in as an administrator.
3. Select the virtual machine currently running SolarWinds Virtualization Manager.
4. Click the **CD/DVD** utility icon, and then click **CD/DVD Drive 1 > Connect to ISO image on local disk**.
5. Select the .iso file, and then click **Open**.

6. Open a browser to `https://ip_address:5480` where `ip_address` is the IP address or name of the SolarWinds Virtualization Manager VM.
7. Log in to the website using your SolarWinds Virtualization Manager credentials.
8. Click the **Update** tab.
9. Click **Check Updates**.
10. Click **Install Updates**, and then click **OK**.

Note: If Virtualization Manager displays odd behavior after an upgrade, you may need to clear the browser cache.

Upgrading on Hyper-V

The appliance upgrade comes as an .iso file for use with the Hyper-V client.

To upgrade Virtualization Manager on Hyper-V, complete the following steps:

1. Save the .iso file to a data storage that you can access from the virtual machine running SolarWinds Virtualization Manager.
2. Run the Hyper-V Manager.
3. Select the virtual machine currently running SolarWinds Virtualization Manager.
4. Click **Settings**.
5. Click **DVD Drive**.
6. Select the **Image file**, and then click **Browse**.
7. Select the .iso file, and then click **Open**.
8. Click **OK**.
9. Open a browser to `https://ip_address:5480` where `ip_address` is the IP address or name of the SolarWinds Virtualization Manager VM.

10. Log on to the website using your SolarWinds Virtualization Manager credentials.
11. Click the **Update** tab.
12. Click **Check Updates**.
13. Click **Install Updates**, and then click **OK**.

Note: If Virtualization Manager displays odd behavior after an upgrade, you may need to clear the browser cache.

Additional upgrade steps for AD/LDAP authentication

Previous versions of the virtual appliance version of this software required you to edit the `hyper9-config-jaas.conf` configuration file to configure authentication for your Active Directory (AD) or LDAP users. Starting with SolarWinds Virtualization Manager 4.0, you set up authentication for AD/LDAP users from the Authentication Server configuration page.

If you have never made changes to the configuration file before upgrading, configuring authentication for your AD/LDAP users works as described in [Configuring authentication servers](#).

If you are upgrading from 4.0 to newer versions of Virtualization Manager, you must reenter the bind password.

If you have existing changes to the configuration file, authentication for AD/LDAP users may not work until you manually update the configuration file.

To fix AD/LDAP authentication for an upgraded appliance:

1. Log on to the administration website of SolarWinds Virtualization Manager with your admin credentials.
Note: Typically, this is `https://hostname:5480` where `hostname` is the host name or IP address of your appliance. Acknowledge the security certificate warning, and then continue to the website.
2. Click **Management > Edit Configuration**.

3. Select `hyper9-config-jaas.conf`, and then click **Edit**.
4. Replace all of the existing content with the following, and then click **Save**.

```
hyper9 {  
  com.hyper9.security.auth.Hyper9AuthLoginModule required debug=true;  
};  
  
h9kerberos {  
  com.sun.security.auth.module.Krb5LoginModule required client=TRUE  
  refreshKrb5Config=TRUE;  
};
```

5. Click **Restart**, and then click **Confirm Restart**.
6. Log on to the regular SolarWinds Virtualization Manager website.
7. Click **Configuration**, and then click **Authentication Server** on the left menu.
8. Follow the AD/LDAP configuration instructions in [Configuring authentication servers](#).

Activating the license

If you upgrade without a valid maintenance license, SolarWinds Virtualization Manager may not be able to apply a new license. Change the permissions of the `etc/.java` file, and then activate your license.

To change the permissions of the `etc/.java` file:

1. Log on to the virtual appliance console using the admin account credentials. You can open the console by using your VM management system to connect to or open the console.
2. Type `sudo chmod -R 777 /etc/.java` in the command line.
3. Exit the console.

If you encountered an error during activation, the SolarWinds licensing server may have already activated your license. In this case, either use the instructions

in [Activating a license key offline](#) to manually upload your license, or contact SolarWinds Customer Service to reset your activation.

Solving upgrade issues

The following issues may occur during and after the upgrade procedure.

Historical data is unavailable during the search index rebuild

After the upgrade process has completed, the database search index is rebuilt. This process can take between 20 minutes and two days to complete, depending on the size of the database and its disk performance. Until the index rebuild is finished, some performance graphs do not display historical data. If the system has to be restarted, the indexing will resume where it left off.

Restoring the SolarWinds Mgmt tab

Occasionally the **SolarWinds Mgmt** tab is unavailable after an upgrade. If it has not returned after 60 seconds, log out of the administration website, clear the browser cache, and close the browser. The **SolarWinds Mgmt** tab will be available the next time you log on to the administration website.

NTP status is blank

After the upgrade process has completed, the NTP status may be blank in the SolarWinds Virtualization Manager administration website. If this occurs, click **Restart ntpd**.

Updating an existing Windows installation

Starting from SolarWinds Virtualization Manager 5.0, SolarWinds no longer provides a Windows installer and previous versions cannot be upgraded to the current version.

To help you upgrade, SolarWinds provides a migration tool to move your data from your Windows installation to a virtual appliance, and a Hyper-V virtual appliance that deploys Virtualization Manager in a Windows environment.

Migrating from an existing virtual appliance to a new virtual appliance

With the migration tool you can move your data from an existing instance of Virtualization Manager to a new virtual appliance.

Note: If the existing database is larger than 60 GB and you are migrating to a thin-provisioned virtual machine, ensure that the provisioned disk size is large enough to accommodate the data. The recommended size is the existing database plus 50%. You must restart the virtual appliance after changing the disk size and before moving the data.

To migrate from an existing virtual appliance to a new virtual appliance:

1. Follow the instructions in [Installing Virtualization Manager as a virtual appliance](#) to install a virtual appliance on vSphere or Hyper-V.
2. Set the time zone of the new appliance to match the time zone of the existing appliance by completing the following steps:
 - a. In the console, use the arrow keys to select **Set Timezone**, and then press enter.
 - b. Select the same time zone as the time zone of the existing virtual appliance from which you are migrating.
 - c. Type '1' when prompted to confirm the time zone.
 - d. Restart the virtual machine.
3. Log on to the administration website of the new installation (`https://ipAddress:5480`) as user `admin` and password `admin`.
4. Navigate to **SolarWinds Mgmt.**
5. Click **Migrate Data From Old Hyper9 / VMgr Server**.
6. Select **Prepare source appliance for migration**, and then enter the user name and password of the source appliance.

7. Enter the host name or IP address of the existing virtual appliance that you are migrating from in the text field of **Step 2**.
8. Click **Perform Migration**. The migration tool moves your information to the new virtual appliance.

Installing, updating and uninstalling a federated collector

By using a federated collector, you can split the data collection tasks of SolarWinds Virtualization Manager between one or more remote servers. The federated collector has no database of its own. Its function is to serve as a proxy, collecting configuration and performance data and relaying the collection back to SolarWinds Virtualization Manager. To monitor 10,000 VMs or more, it is strongly recommended that you use a federated collector.

Reasons for deploying a federated collector include scalability and geography. A single SolarWinds Virtualization Manager data collector might not have sufficient computing resources by itself to collect data from very large virtual environments with thousands of VMs. If you experience slow performance due to collection, consider deploying a federated collector.

Additionally, it is more efficient to collect data from distant vCenters by deploying a federated collector in that distant location and having the collector periodically phone home with a dense stream of data. If your organization uses WANs, consider deploying a federated collector.

To use federated collectors, TCP port 61616 must be open on SolarWinds Virtualization Manager. For more information, see [Port requirements](#).

Note: Upgrading to the latest version of Virtualization Manager upgrades the Virtualization Manager software on both the master virtual appliance and on federated collectors. However, while the upgrade to Virtualization Manager also raises the CentOS version on the master appliance, you must manually upgrade CentOS on federated collectors using the .ISO file.

Installing a federated collector

The federated collector is distributed as a VMware virtual appliance OVF template.

To deploy and configure a federated collector:

1. Extract the contents of the Collector .zip archive file.
2. In the VMware client, deploy the new federated collector appliance from the OVF template in the same way you deploy a SolarWinds Virtualization Manager server. For information about installing a Virtualization Manager server, see [Installing Virtualization Manager as a virtual appliance](#).
3. Open the console for the federated collector, and then turn on the virtual appliance.
4. Configure the appliance with appropriate network settings in the same way you configure a SolarWinds Virtualization Manager server.
5. Log on to the administration website of the new collector (`https://ipAddress:5480`) with the user `admin` and the password `admin`.
6. Click the **SolarWinds Data Collector** tab.
7. In the **Collector Timezone** field, select the time zone of the main SolarWinds Virtualization Manager. Do not set this to the time zone of the collector.
8. In the **Collector Hostname** field, type the host name you want to use for this collector.
9. In the **Collector Display Name** field, type a unique identifier that will be used to refer to this collector in SolarWinds Virtualization Manager. For example: `tokyo-collector`.
10. In the **SolarWinds Virtualization Manager Server Address** field, type the host name or IP address of the main SolarWinds Virtualization Manager.
11. Click **Configure Now**. The federated collector is now ready to accept data source collection assignments from SolarWinds Virtualization Manager.

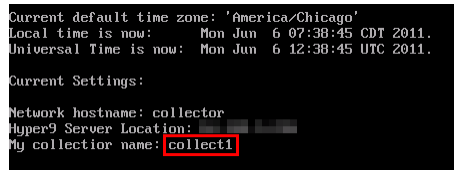
For more information, see [Configuring data sources](#).

Updating a federated collector

Any federated collectors from versions earlier than 4.0 must be shut down and replaced with the new federated collector. To prevent having to remap existing collections to the new collector, reuse the previous Collector Display Name for the new collector.

To keep the same display name for the new collector:

1. Log on to the VMware client as an administrator.
2. Open the VMware console for the collector appliance.
3. Type `configure` at the login prompt, and then run the time zone configuration.
4. After configuring the time zone, note the collector's name.



```
Current default time zone: 'America/Chicago'
Local time is now:      Mon Jun  6 07:38:45 CDT 2011.
Universal Time is now:  Mon Jun  6 12:38:45 UTC 2011.

Current Settings:
Network hostname: collector
Hyper9 Server Location:
My collector name: collect1
```

5. In the VMware client, shut down and delete the old collector.
6. Extract the contents of the Collector .zip archive file.
7. In the VMware client, deploy the new federated collector appliance from the OVF template.
8. Power on the federated collector, and then configure it through the console with your network settings.
9. Log on to the administration website of the new collector (`https://ipAddress:5480`).
10. Click the **SolarWinds Data Collector** tab.
11. In the **Collector Timezone** field, select the time zone of the main SolarWinds Virtualization Manager.

12. In the **Collector Hostname** field, enter the host name you want to use for this collector.
13. In the **Collector Display Name** field, enter the display name of the previous collector.
14. In the **SolarWinds Virtualization Manager Server Address** field, enter the host name or IP address of the main SolarWinds Virtualization Manager.
15. Click **Configure Now**.

Uninstalling a federated collector

In order to delete a federated collector that is associated with Virtualization Manager, complete the following steps.

To uninstall a federated collector:

1. On the Setup tab of Virtualization Manager, click **Data Sources** on the left menu.
2. Select a data source, and then click **Edit**.
3. Select a different collector for the data source from the **Collector** list than the one you want to delete.
4. Click **Save**.
5. Repeat **Steps 2 - 4** for each data source.
6. Turn off the federated collector, and then delete the virtual machine.

Licensing

SolarWinds Virtualization Manager is licensed according to the number of CPU sockets per monitored host. If you try to monitor more sockets or VMs than your license allows, you will not be able to add more data sources and you will not be able to apply upgrades or updates to SolarWinds Virtualization Manager.

If you are licensed per VM, you can continue to use that license. Contact your SolarWinds sales representative if you have questions about your license.

The section contains information about the following topics:

- [License management in Virtualization Manager version 6.2](#)
- [License management starting from Virtualization Manager version 6.1](#)
- [Using licenses from previous versions](#)
- [Viewing your licensing status](#)
- [Activating a license key online](#)
- [Activating a license key offline](#)
- [Excluding hosts from monitoring](#)

License management in Virtualization Manager version 6.2

In Virtualization Manager version 6.2, the license you have to apply consists of two parts: a primary and a secondary license. The primary license key is installed on the Virtualization Manager appliance. The secondary license key is installed on the SolarWinds Orion server if you integrated Virtualization Manager with your SolarWinds Orion server. If you use Virtualization Manager without integrating it with a SolarWinds Orion server, the secondary license is not used.

Note: You can integrate one Virtualization Manager with one SolarWinds Orion server. To integrate Virtualization Manager with a different SolarWinds Orion server, deactivate both the primary and the secondary license. The licenses then become available to be activated again on a different instance.

The following sections provide information about the different steps and order of activating your Virtualization Manager license, depending on the additional Orion platform products you use and integrate Virtualization Manager with.

Activating the license on a standalone Virtualization Manager installation

If you install a standalone Virtualization Manager, or upgrade a Virtualization Manager appliance that is not integrated with the SolarWinds Orion server, perform the following steps to activate your license.

Activating the license on Virtualization Manager integrated with the SolarWinds

1. Install or upgrade the Virtualization Manager appliance. For installation instructions, see [Installing Virtualization Manager as a virtual appliance](#), for upgrade instruction, see [Upgrading an existing virtual appliance](#).
2. Activate the primary license key on the appliance. For license activation instructions, see [Activating a license key online](#) or [Activating a license key offline](#).

Note: An error message is displayed if you attempt to install the secondary license key on the Virtualization Manager appliance.

Activating the license on Virtualization Manager integrated with the SolarWinds Integrated Virtual Infrastructure Monitor

If you install or upgrade a Virtualization Manager appliance that is integrated with the SolarWinds Integrated Virtual Infrastructure Monitor, install the products and activate the license keys in the following order.

New installation:

1. Install the SolarWinds Integrated Virtual Infrastructure Monitor and the Virtualization Manager appliance. For installation instructions, see [Installing the SolarWinds Integrated Virtual Infrastructure Monitor in standalone mode](#) and [Installing Virtualization Manager as a virtual appliance](#).
2. Integrate the Virtualization Manager appliance with the SolarWinds Orion server. For integration instructions, see [Preparing for the integration of Virtualization Manager](#).
3. Activate the primary license key on Virtualization Manager. For license activation instructions, see [Activating a license key online](#) or [Activating a license key offline](#).
4. Activate the secondary license key on the SolarWinds Integrated Virtual Infrastructure Monitor.

Note: You can also activate the primary license key on the SolarWinds Integrated Virtual Infrastructure Monitor, and the secondary license key on Virtualization Manager.

Upgrade:

1. Upgrade the Virtualization Manager appliance. For upgrade instructions, see [Upgrading an existing virtual appliance](#).
2. Install the SolarWinds Integrated Virtual Infrastructure Monitor. For installation instructions, see [Installing the SolarWinds Integrated Virtual Infrastructure Monitor in standalone mode](#).
3. Integrate the Virtualization Manager appliance with the SolarWinds Orion server. For integration instructions, see [Preparing for the integration of Virtualization Manager](#).
4. Activate the primary license key on the Virtualization Manager appliance. For license activation instructions, see [Activating a license key online](#) or [Activating a license key offline](#).
5. Activate the secondary license key on the SolarWinds Orion server.

Note: You can also activate the primary license key on the SolarWinds Orion server, and the secondary license key on Virtualization Manager.

Activating the license on a Virtualization Manager instance licensed per VM

If you use a Virtualization Manager appliance that is licensed per VM instead of per socket, upgrade the products and activate the license keys in the following order.

1. Upgrade the SolarWinds Orion server.
2. Upgrade the Virtualization Manager appliance. For upgrade instructions, see [Upgrading an existing virtual appliance](#).

Activating the license on Virtualization Manager integrated with SolarWinds NPM

3. Activate the primary license key on Virtualization Manager. For license activation instructions, see [Activating a license key online](#) or [Activating a license key offline](#).
4. Activate the secondary license key on the SolarWinds Orion server.

Note: You can also activate the primary license key on the SolarWinds Orion Server, and the secondary license key on Virtualization Manager.

Activating the license on Virtualization Manager integrated with SolarWinds NPM or SolarWinds SAM

If you install or upgrade a Virtualization Manager appliance that is integrated with SolarWinds Network Performance Monitor (NPM) or SolarWinds Server & Application Monitor (SAM), install the products and activate the license keys in the following order.

New installation:

1. Install Virtualization Manager. For installation instructions, see [Installing Virtualization Manager as a virtual appliance](#).
2. Install SolarWinds NPM or SolarWinds SAM. For installation instructions, see [Completing an Orion NPM installation](#) or [Installing SolarWinds Server & Application Monitor](#).
3. Activate the primary license key on Virtualization Manager. For license activation instructions, see [Activating a license key online](#) or [Activating a license key offline](#).

Note: In this case, you can leave the secondary license unused. However, you can also activate an evaluation license for SolarWinds Integrated Virtual Infrastructure Monitor. In this case, see the instructions about [Activating the license on Virtualization Manager integrated with the SolarWinds Integrated Virtual Infrastructure Monitor](#).

Upgrade:

1. Upgrade SolarWinds NPM or SolarWinds SAM. For upgrade instructions, see [Upgrading SolarWinds Network Performance Monitor](#) or [Upgrading SolarWinds Server & Application Monitor](#).
2. Upgrade Virtualization Manager. For upgrade instructions, see [Upgrading an existing virtual appliance](#).
3. Activate the primary license key on Virtualization Manager. For license activation instructions, see [Activating a license key online](#) or [Activating a license key offline](#).

Note: In this case, you can leave the secondary license unused. However, you can also activate an evaluation license for SolarWinds Integrated Virtual Infrastructure Monitor. In this case, see the instructions about [Activating the license on Virtualization Manager integrated with the SolarWinds Integrated Virtual Infrastructure Monitor](#).

License management starting from Virtualization Manager version 6.1

Starting from Virtualization Manager version 6.1, you can upgrade licenses without manual intervention. The appliance periodically connects to the licensing server, and when it detects that a new license is available, it downloads and applies the license automatically.

If you are using Virtualization Manager with an evaluation license, the application does not perform the license update check. The automatic license update checks start after you activate your first commercial license key, either through online or offline activation.

By default, the automatic license synchronization is enabled, and the appliance checks for license updates once every 24 hour. The first license check is performed 1 hour after the initial startup of the application. This value is controlled by the `license.synchronizer.initial.delay` property. You can modify the default settings in the System Properties page of Virtualization Manager.

To modify the default settings:

1. Navigate to **Setup > Advanced Setup**.
2. Click **System Properties**.
3. To modify the default license update checking frequency, click in the **Value** column next to `license.synchronizer.check.frequency`. The minimum frequency is 24 hours.
4. To disable automatic license synchronization, click in the **Value** column next to `license.synchronizer.enabled`, and then set the property to false.

Notes:

- If there is no internet connectivity when Virtualization Manager starts, the automatic license synchronization will not be enabled.
- Despite the changes in licensing and license updating, the earlier licenses remain operable, and the methods of online and offline license key activation remain the same.

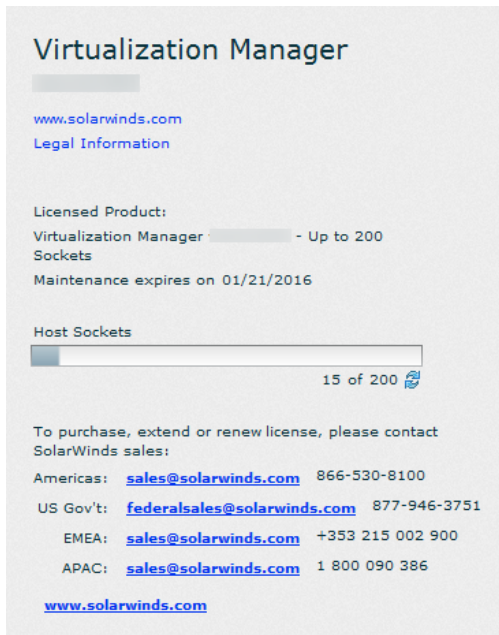
Using licenses from previous versions

SolarWinds Virtualization Manager incorporates the SolarWinds licensing system that uses a different kind of license key than what was used in version 3.0.5 and earlier. After you upgrade to the current version, the upgraded system will be licensed with a temporary 30-day trial license.

To relicense your software, see [Activating a license key online](#) and [Activating a license key offline](#).

Viewing your licensing status

To view your license status information, log on to Virtualization Manager, and then click **Help**.



Activating a license key online

If you can access the SolarWinds website from a computer that can also access SolarWinds Virtualization Manager, you can activate your license key online.

To activate a license key online:

1. Log on to the SolarWinds Customer Portal at <https://customerportal.solarwinds.com>.
2. Under **Licensing & Maintenance**, click **License Management**.
3. Locate an unregistered Virtualization Manager activation key in your license list.
4. In a separate browser window, log on to SolarWinds Virtualization Manager.
5. Click **Setup** in the top menu.
6. Click **License Information** in the left menu.
7. Click **Activate License**.

8. Copy the Activation Key from the Customer Portal, and then paste it into the **Activation Key** field of the SolarWinds Virtualization Manager License Information page.
9. In the **Computer Name** field, type `localhost`.
10. Provide your name, company name, email address and phone number.
11. Click **Send Activation Request**.

Activating a license key offline

If proxy or firewall restrictions prevent the same computer from accessing both the SolarWinds website and SolarWinds Virtualization Manager, you can request a license file that you can then manually upload to the server.

To activate a license key offline:

1. Log on to SolarWinds Virtualization Manager.
2. Click **Setup** in the top menu.
3. Click **License Information** in the left menu.
4. Click **Unique Machine ID**, copy the machine ID, and save it on a flash device.
5. Go to a computer with internet access, and then log on to the SolarWinds Customer Portal at <https://customerportal.solarwinds.com>.
6. Click **License Management** under Licensing & Maintenance.
7. Locate an unregistered Virtualization Manager activation key in your license list.
8. Click **Manually Register License** to the right of the activation key.
9. Enter your name, email address and phone number in the associated fields.
10. In the **Computer Name** field, enter `localhost`.
11. In the **Unique Machine ID** field, paste the machine ID you copied from SolarWinds Virtualization Manager.

12. Click **Generate License File**.
13. Click the license download link to download the license file.
14. Transfer the license file to the computer you are using to access SolarWinds Virtualization Manager.
15. Click **Upload License File**.
16. Select your license file, and then click **Open**.

Excluding hosts from monitoring

If you do not have enough SolarWinds Virtualization Manager licenses to cover every powered on virtual machine managed by a vCenter server, you can change the access permissions of the vCenter user account to limit what it can access.

Restricting the VMs accessible by the user account reduces the number of VMs, or sockets, SolarWinds Virtualization Manager can collect data from, and allows you to control which VMs are being monitored.

You can typically control access permissions in the VMware client by assigning the "No Access" role to the vCenter account for the hosts and VMs you want to restrict.

To exclude a host:

1. Expand the "Host & Clusters" until you locate the host you want to exclude.
2. Right-click the host, and then click **Add Permission**.
3. Add the user performing SolarWinds Virtualization Manager data collection but assign the role No Access. This eliminates the host from all data collection including WMI.

For more information, search for the basic system administration guide on the [VMware documentation site](#).



Chapter 3: Administration and setup

This topic contains information about administration and setup activities in two parts:

Basic setup

Basic setup is the process required to initiate the first Data Collection operations to populate the data repository. Data Collection is the enumeration of objects, such as VMs, on data sources, such as vCenter Servers or ESX hosts, and the process of gathering configuration and sample data from the enumerated objects.

Advanced setup

By using advanced setup, you can fine tune data collection, configure SNMP and SMTP, and manage user access to SolarWinds Virtualization Manager.

Basic setup

The result of basic setup is a well-populated repository of virtual infrastructure information on which you can conduct searches, show data center trends, and graph performance data. In order to reach this goal, at least one Configuration Data and one Sample Data job must be scheduled and executed to completion on a licensed server. This is done by specifying endpoints such as VMware vCenter servers or unmanaged ESX hosts that need to be interrogated for virtual machine information. To extract information from such endpoints, proper credentials must be supplied to pass authentication requirements.

The Configuration Wizard guides you through the basic steps to enable your SolarWinds Virtualization Manager installation for data collection.

To run the Configuration Wizard:

1. Log on to SolarWinds Virtualization Manager.
2. Click **Setup**.
3. Click **Configuration Wizard** on the left menu.

Filling in the SolarWinds registration

The first step in basic setup requires you to register your software. Enter the email address you provided when registering to download the software. A valid email address is required to continue.

Configuring credentials

The next step in the Configuration Wizard is to enter a set of credentials that will be used to access the data sources you just defined. Depending on the intended usage, provide the following types of credentials:

- Administrator credentials to any Virtual Center endpoints.
- Root credentials to ESX hosts (whether managed or unmanaged).
- Windows Domain Administrator credentials for Hyper-V hosts or virtual machines which are Windows Domain members and also open to data collection via Windows Management Instrumentation (WMI).

Note: Instead of assigning credentials to each data source, in SolarWinds Virtualization Manager, you enter all of your credentials in one place. During the initial data collection, SolarWinds Virtualization Manager attempts to authenticate each credential with a data source until it finds one that works. That credential is then automatically cached with an association to that data source.

Click **Add** to enter a new credential. For each credential set, provide the following information:

- **Credential Type:** Select Virtual Center, Host, or Hyper-V and WMI depending on the intended usage of this credential.

- **Username:** The login name or user ID of the account. This is usually root, administrator, or some domain administrator account.
- **Password:** The password for the given user name.
- **Domain:** A domain associated with the credentials.
- **Description:** A description of the credential set.

After you entered the necessary information, click **Save** to add the credential to the Credential Pool. This returns you to the Credentials screen.

After you entered all your credentials, click **Next** to continue.

Note: For enhanced security, it is recommended that you change the default admin credentials.

To change the default credentials of the admin account:

1. Connect to the Virtualization Manager Administration Console through `https://IP_address:5480` where `IP_address` is the IP address of your appliance.
2. Navigate to **SolarWinds Mgmt > Change Password**, and then type the new password.
3. Click **Change**.

Configuring data sources

Click **Add** to enter a new data source. For each data source you enter, provide the following information:

- **Host Type:** A Virtual Center, Unmanaged Host, or Hyper-V host.
- **Network Address:** The static IP address or fully qualified domain name of the data source.
- **TCP Port:** The HTTPS port of the admin page for this data source.
- **Description:** A brief description of the data source.

- **Collector:** If you have set up a federated data collector to use for this collection, select the federated collector. In other cases, select **localhost**.
- **Validate Connections:** An optional step to confirm that the data source is reachable.

If you selected Hyper-V, provide the following information:

- **Group Name:** A description of the Hyper-V host groups.
- **Network Address:** The static IP address or fully qualified domain name of the data source.
- **CIDR or Range:** The range where the host is located (if applicable).

When you add a Hyper-V data source, a discovery job is automatically created and enabled. The hosts discovered by this job are then subject to configuration and performance data collection as configured in [Configuring collection schedules](#).

After entering the necessary information, click **Save** to add the endpoint to the data source list.

After you entered all your data sources, click **Next** to continue.

Configuring collection schedules

The Collection Schedules screen should be predefined with a pair of default schedules for each data source you have defined. One collection schedule for configuration data and one collection for sample (performance) data per data source is defined in the collection schedule.

Select the Configuration and Performance collection schedules, and then click **Enable** to start the data collection. Hold the Shift, Ctrl, or Command keys to select multiple schedules and enable them all at once.

To modify the default schedules for timings and interval of execution preferences, select a schedule, and then click **Change Schedule**.

Note: Configuration jobs should not occur more often than once per hour. For all practical purposes, the default setting of collection once every 12 hours is sufficient. Sample schedules default to run every 10 minutes and this is fast enough for most practical applications.

For each collection schedule, you can modify the following information by clicking **Change Schedule**:

- **Start Time:** Indicates the date and time from which to begin the data collection job.
- **Performance Interval:** Indicates the time interval on which the job is performed.
- **Enable Schedule:** Indicates whether the job is enabled or disabled for data collection.

Note: For each data source, schedule two jobs to provide configuration, performance, and state information for virtual machines, a configuration data collection job and a sample data collection job. This includes VirtualCenters, unmanaged ESX hosts, and Hyper-V hosts.

After all of the data collection jobs have been scheduled and enabled, the scheduler executes each job at the specified start time and continues to run them at the specified interval. The time it takes for a job to complete varies widely based on the size of the environment to be collected from. To execute a collection schedule immediately, select the schedule on the Collection Schedules screen, and then click **Run Now**.

For more information about the way Virtualization Manager collects data and calculates rollup information, see [Collecting data and calculating rollup information](#).

Infrastructure aging

The entities in Virtualization Manager go through the following life cycle:

Active VMs

Virtual machines which are accessible for data collection and are registered with their hosts or Virtual Center. This is the normal state for virtual machine records. These machines are searchable in the current and historical time frames.

Stale VMs

Virtual machines which are either inaccessible for data collection or unregistered with their hosts or Virtual Center for the defined "Active to Stale" interval. These virtual machines are searchable, however, they appear dimmed to indicate their stale status.

Decommissioned VMs

Virtual machines which have been "Stale" for the defined "Stale to Decommissioned" interval. These virtual machines are no longer searchable in the current time frame. These virtual machines still exist in the data repository as historically searchable records.

The interval between these life cycle changes is controlled by system properties which are accessible from **Setup > System Properties** in Virtualization Manager. For more information, see [Configuring system properties](#).

Configuring SMTP settings

SolarWinds Virtualization Manager uses email to deliver alert notifications. In addition, reports can be delivered as attachments to emails to interested parties either as needed or on a scheduled basis. However, email can only be delivered if you configure an SMTP server to send outgoing emails.

Provide the following information on the SMTP Configuration page of the Configuration Wizard:

- **Hostname:** The IP address or host name of the SMTP server.
- **TCP Port:** Port that the email server expects SMTP connections.
- **Authentication Username:** The email account used to send emails from this SMTP server.

- **Authentication Password:** The password for the email account used to send emails from this SMTP server.
- **From Address:** Sent emails arrive from this email address.
- **Email Subject Prefix:** Sent emails have this text as the beginning of their subject line. More text will be added after this prefix to describe the purpose of the email.

Click **Next** after entering this information.

Configuring the Storage Manager installation details

If you have SolarWinds Storage Manager installed, you can link data stores on the details page to open their corresponding Storage Manager web pages. If you do not have SolarWinds Storage Manager installed, you can leave these fields blank.

All NFS target volumes have links to the STM view, and all NFS target volume information is searchable. For example, if the target name is `/vol/lab_Vcenter_41_NFS_Vol01`, you can paste that string in the Search resource and filter based on it.

Provide the following information on the Storage Manager configuration page:

- **Network Address:** The IP address or host name of the Storage Manager server.
- **TCP Port:** The port used for the Storage Manager web server. The default port is 9000.
- **Storage Manager Username:** The user you want to automatically log on as when requesting a Storage Manager page
- **Storage Manager Password:** The password corresponding to your Storage Manager user name.

Click **Test** to verify that you can successfully connect to Storage Manager, and then click **Finish**.

At the end of the Configuration Wizard, the Configuration Summary screen is displayed. This screen displays the data collection schedules that are in progress and provides information about how the collections are performing.

This completes the basic configuration of Virtualization Manager and if all collections are completed as scheduled, you will be able to query for virtual machine data shortly from the main interface by clicking **Home** and entering a query in the search interface.

Configuring HTTPS access only

You can block HTTP access to the web console. By doing this you can make HTTPS the only allowed protocol through which to access the console.

To block HTTP access:

1. Log on to the administration website of the installation
(`https://ipAddress:5480`) as user `admin` with the password `admin`.
2. Navigate to **SolarWinds Mgmt.**
3. Click **Block HTTP access**.
4. Restart the virtual appliance by clicking **Restart Virtualization Manager**.

Enabling Dynamic Memory on Hyper-V 2008 servers

Virtualization Manager requires using Dynamic Memory in Hyper-V. A system such as Windows Server 2008 without SP that does not have the capability of providing dynamic memory usage will report memory utilization at 100%. To ensure that correct memory utilization values are shown in memory calculations and alerts, enable Dynamic Memory.

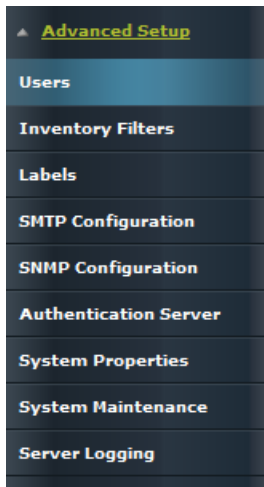
To enable Dynamic Memory:

1. Launch the Hyper-V Manager.
2. Shut down the virtual machine.
3. Right-click the virtual machine, and then click **Settings**.
4. Navigate to **Hardware > Memory**.

5. Under **Memory Management**, click **Dynamic**.
6. Set the amount of memory for **Startup RAM** and **Maximum RAM**.
7. Turn on the virtual machine.
8. If the guest operating system is Windows 7, log on to the virtual machine to complete the configuration.

Advanced setup

The yellow **Advanced Setup** link on the left menu of the Administration page opens the advanced setup menu.



Typical elements that require advanced setup include the following:

- Administering users and access
- Adding or modifying user credentials when passwords are updated or staffing changes occur
- Setting up default dashboards for users
- Configuring guest (WMI) inclusion masks to accommodate changes in WMI-accessible infrastructure
- Creating and managing searchable labels

- Configuring a mail server to send email alerts
- Configuring SNMP traps to integrate with a third party systems management tool
- Configuring low-level system properties
- Initiating tasks that perform maintenance

You can accomplish these tasks by selecting their corresponding menu item under Advanced Setup on the Configuration page.

User management

To control user access to SolarWinds Virtualization Manager, select the **Users** menu option. Here you can add, edit, or delete users from the internal credential store.

To add a new user, click **Add**, and then provide the following information:

- **Username:** The login name of the user.
- **Role:** User or Admin roles are available to any user.
 - User Role: Has access only to the user side of SolarWinds Virtualization Manager.
 - Admin Role: Can access both the user and administrator sides of SolarWinds Virtualization Manager.
- **Enabled:** Whether this account is currently enabled. Disabled accounts cannot log on.
- **Local Auth:** Accounts with local authentication use the internal authentication of SolarWinds Virtualization Manager. Otherwise, LDAP pass-through authentication is used to verify credentials using sources such as Active Directory.
- **Password:** The password of the user with a second box to confirm.
- **Full Name:** The full name of the user.

- **Email:** The email address for the user.
- **Description:** A brief description of the user.

Click **Save** to finish the process.

Click **Edit** to edit the full name, email address, and description of the selected account.

Click **Change Password** to enter and verify a new password for the selected account.

Setting default dashboards for users

New users get the standard default dashboards of SolarWinds Virtualization Manager. However, you can specify exact dashboards for the user by clicking **Dashboard**.

Select up to five available dashboards from the left column, and then click the right arrow to make those dashboards the default for a user. This feature is useful for making dashboards relevant to the user's position in the company. For example, you can give storage administrators storage dashboards by default, while giving managers the manager dashboard.

Using inventory filters

In the Inventory Filters configuration page you can limit the scope of data collection activities by restricting the virtual machines that SolarWinds Virtualization Manager interrogates for WMI information.

The default filter includes all guests for WMI. This is done by making a "filter" with the subnet address 0.0.0.0 and a subnet mask of 0.

To create additional filters:

1. Provide the IP address or range that you want to include. This process is described at the [CIDR Calculator](#).
2. Click **Add**.

3. Enter the **Network address** and **Mask** for your new inclusion list.
4. Click **Save**.

You can add as many filters as you want to include multiple ranges of IP addresses.

Using labels

The Labels configuration page provides you with a quick way of creating a series of custom labels that you can apply to VMs and hosts.

To create a label, click **Add Label**.

For more information, see [Custom labels](#).

Configuring SNMP

SolarWinds Virtualization Manager can send SNMP traps for events that occur in the system such as the following:

- New VMs are discovered
- Alerts are raised or lowered

To configure SNMP traps, click **SNMP Configuration**.

To specify a new host that will receive SNMP traps, click **Add Trap Host**. Enter the following information to configure a new SNMP integration.

- **Host Address:** The IP address or FQDN of the receiver of SNMP alerts.
- **Community String:** The SNMP community string which is used for read-only access to SolarWinds Virtualization Manager alerts.
- **UDP Port:** The port the SNMP receiver expects SNMP UDP traffic.
- **Retries:** The number of times to resend the SNMP trap if no acknowledgment is received.
- **Timeout (ms):** The amount of time to wait for acknowledgment before attempting a retry.

After saving a new Trap Host, click **Send Test Trap** to test the integration.

SNMP trap receivers may need details of the Manager alert MIB (Management Information Base). Click **MIB** to view the entire SolarWinds Virtualization Manager MIB.

Configuring authentication servers

In the Authentication Server configuration page you can configure the Active Directory servers (Domain Controller), or LDAP servers that are used to authenticate Active Directory (AD) or LDAP users.

You can configure multiple authentication servers, based on the domain prefix you specify. You can configure a default domain entry, or configure an entry for each domain prefix.

Virtualization Manager also supports the use of mixed mode authentication.

Adding an Active Directory authentication server

To add an Active Directory authentication server, perform the following steps:

1. Click **Add**.
2. From the **Authentication Type** list, select **Active Directory**.
3. If you want this to be the authentication server for users who log in to Virtualization Manager without specifying a domain prefix, click **Use for all accounts where a domain is not specified**.
4. If you want this to be the authentication server for users who specify a domain prefix, click **Use for this domain only**, and then enter the specific domain in the text field. The domain name prefix is case-sensitive.
5. In the **Server** field, type the IP address of the Active Directory server.
6. In the **Port** field, type the port used for AD authentication. The default port is 389.
7. Optionally, provide a description for the Active Directory server.

8. Optionally, to test the IP address of the server for connectivity, select the **Validate Connections** check box.
9. In the **Realm Name** field, type in uppercase the realm configuration name that was used when setting up the Active Directory server. You can obtain the realm name from your Active Directory administrator.
10. Click **Save**.

Note: If you cannot log on, check the log file, and look for the following error message:

```
[http-8080-5] INFO  
com.hyper9.security.auth.Hyper9AuthLoginModule:121 - Login  
failed: Clock skew too great (37).
```

This error occurs when there is more than a couple of minutes difference between the system times of the client machine and the Content Engine server. Make sure you synchronize the time on both systems.

Adding an LDAP authentication server

To add an LDAP authentication server, perform the following steps:

1. Click **Add**.
2. From the **Authentication Type** list, select **LDAP**.
3. If you want this to be the authentication server for users who log in to Virtualization Manager without specifying a domain prefix, click **Use for all accounts where a domain is not specified**.
4. If you want this to be the authentication server for users who specify a domain, click **Use for this domain only**, and then enter the specific domain in the text field.
5. In the **Server** field, type the IP address of the LDAP server.
6. In the **Port** field, type the port used for LDAP authentication. The default port is 3268.
7. Optionally, provide a description for the LDAP server.

Synchronizing the time of the AD and LDAP server and the SolarWinds

8. Optionally, to test the IP address of the server for connectivity, select the **Validate Connections** check box.
9. In the **Search Filter** field, type the LDAP query filter you want to use to map user accounts to the LDAP server entries. For example: `(cn=*)`.
10. In the **Search Base** field, type the portion of the directory tree you want to search for LDAP users. For example: `dc=example,dc=com`.
11. In the **Bind User** field, specify a user with LDAP search permissions. The bind user is used to connect to the LDAP server. For example:
`user@example.com`.
12. In the **Bind Password** field, enter the password of the bind user. You can obtain the bind user ID and bind password from your LDAP administrator.
13. Click **Save**.

Synchronizing the time of the AD and LDAP server and the SolarWinds Virtualization Manager server

For security reasons, you must synchronize the system times of the SolarWinds Virtualization Manager server and the AD or LDAP server. Authentication fails if the two clocks vary by more than five minutes.

If you deployed SolarWinds Virtualization Manager on Microsoft Windows, you can synchronize the system time from the Internet Time tab of the Date and Time dialog box.

If you deployed the virtual appliance, the built-in NTP server support automatically maintains time synchronization.

To customize the NTP synchronization settings (optional):

1. Log on to the Management UI at `https://applianceHostName:5480`.
2. Click the **SolarWinds Mgmt** tab.
3. If you have recently upgraded and the NTP Status is empty, click **Restart ntpd**.

4. Click **Edit Configuration**.
5. Select **ntp.conf**, and then click **Edit**.
6. Customize the NTP settings, and then click **Save**.

Adding AD and LDAP users to SolarWinds Virtualization Manager

To automatically add the AD or LDAP users who log on to SolarWinds Virtualization Manager as authorized users, select **Auto create New Users upon Authentication**.

If you do not select this option, you must manually create user entries in SolarWinds Virtualization Manager for your AD or LDAP users before they can log on. Create a user identically named as the AD or LDAP user with a blank password. For example, if Bob Smith's AD user name is `bsmith`, you must create a `bsmith` user in SolarWinds Virtualization Manager with no password. Make sure **Local Auth** is not enabled for that user.

Configuring system properties

Most internal settings for the SolarWinds Virtualization Manager system can be edited on the System Properties page. These properties fall into two categories. The first category is for properties that can be edited to tune SolarWinds Virtualization Manager according to your needs. The other category is for properties that should NOT be modified unless you are instructed to by SolarWinds Technical Support.

Editing system properties

You can edit each of the following properties by clicking the value of the property and entering a new value. Most of the new entries are automatically picked up by the system, and no restart is necessary. If a restart is required, it is indicated in front of the particular system property.

Active to Stale Interval, Stale to Decommissioned Interval

These properties define how entities (virtual machines, hosts, data stores, clusters, and applications) are treated when they are made unavailable in

successive data collection jobs. The Active to Stale Interval defines the number of hours before a virtual machine goes from Active to Stale state. The Stale to Decommissioned Interval defines the number of hours before a virtual machine goes from Stale to Decommissioned state.

create.private.content.only

This property defines whether non-admin users can create content that is world readable and world writable. If this property is set to true, non-admin users can only create private content, but they can still modify world readable and world writable content that was created by other users.

Days to Retain Raw Performance Data, Days to Retain Performance Data Hourly Rollups

SolarWinds Virtualization Manager frequently collects a large amount of performance data. This data makes up the majority of information in the database. The Days to Retain Raw Performance Data property defines how long to keep the raw data in the system before purging it. Every hour, the raw data is consolidated into an hourly value that represents the average of all values in that hour. The Days to Retain Performance Data Hourly Rollups property defines how long to maintain those hourly values before purging them. Both of these properties are major inputs to the [disk sizing spreadsheet](#) and can be tuned according to the needs of your environment.

Hourly Interval for Trend Execution

Trends run periodically to track historic changes in your environment. By default, they run every four hours, but you can increase or decrease this value to get more or less granularity in your historic trend data.

Allow Application to Contact SolarWinds

SolarWinds Virtualization Manager periodically pulls information from SolarWinds for RSS updates and to deliver non-identifiable usage data about installations. If your installation does not have external access to the internet, set this property to false.

collection.vmware.skip_storagepath_samples

If the value of this property is set to `true`, the storagePath related samples will not be collected in a VMware environment. Turning off the collection of storagePath samples results in improved performance.

List of properties that may not be edited

The following list contain system properties that should NOT be modified unless you are instructed to by SolarWinds Technical Support.

Resource Depletion Percent Threshold

Default setting for the resource depletion calculations. Changing this value results in alerts on resource depletion at the specified percentage instead of the default 100%.

fitment.memory.waste

Default setting for capacity planning. This should not be changed because this field is editable in the capacity planning section of SolarWinds Virtualization Manager.

How many days to use for Resource Depletion

Default setting for capacity planning. This should not be changed because this field is editable in the capacity planning section of SolarWinds Virtualization Manager.

fitment.memory.oversub

Default setting for capacity planning. This should not be changed because this field is editable in the capacity planning section of SolarWinds Virtualization Manager.

fitment.sizing.target

Default setting for capacity planning. This should not be changed because this field is editable in the capacity planning section of SolarWinds Virtualization Manager.

Perform DNS Resolution to Validate VMs

Dictates whether a reverse DNS lookup occurs before collecting data from VM guests. This setting is deprecated.

data.multiplication

Used for scalability testing and should NEVER be changed in a deployed system.

Configuring system maintenance

The System Maintenance configuration page contains functions for enhancing, maintaining, and troubleshooting the SolarWinds Virtualization Manager server. You can perform the following actions of this configuration page.

Run Trends

Recalculates trends immediately, ahead of the regular maintenance schedule.

Run Depletions

Recalculates resource depletion estimates immediately, ahead of the regular maintenance schedule.

Clear Job Trackers

Clears the tracking data from the collection summary page. Clear the tracking data if you have reason to believe the jobs listed on the summary page are inaccurate. Clearing the job trackers does not cancel data collection jobs that are running.

Rebuild Indexes

Rebuilds the search indexes. This may take a long time. While rebuilding, you do not have access to historical data.

Enable Plugin / Disable Plugin

Enables and disables the vSphere 4.0 client plug-in. The vSphere 4.0 plug-in adds a SolarWinds menu to the vSphere client that can launch SolarWinds Virtualization Manager modules from vCenter inventory items.

Note: This plug-in only supports vSphere 4.0 and higher.

The following modules are available:

- Add to App
- View Notes
- Export
- Compare
- Add to Chart
- Map
- Label
- Plan
- View Collected Data

For example, if you right-click a virtual machine, and then click **SolarWinds > Add to Chart**, vSphere opens a performance analyzer window for that virtual machine.

This plug-in also adds a SolarWinds option to the Management panel. This option, available on the Home Page or in the View menu under **Management > SolarWinds**, opens Virtualization Manager inside your vSphere client.

Note: Only one SolarWinds Virtualization Manager can register this plug-in for each vCenter. If you have more than one SolarWinds Virtualization Manager collecting data, you must disable the plug-in on one before enabling it for the other.

Recalc License

Recalculates the license status immediately, ahead of the regular maintenance schedule.

Open Orion Web Console

Opens the Orion Web Console, if the integration with the SolarWinds Orion server is enabled.

Configuring server logging

On the Server Logging configuration page you can enable debug-level verbose logging for several categories of loggable events. Reserve debug logging for troubleshooting only, as debug-level logging can fill up a disk very quickly.

To enable debug-level logging, click **Choose a Logging Category**, and then select a category from the list.

To disable debug-level logging, select a category in the Enabled Debug Logging Categories section, and then click **Clear**.

Viewing the log files

On Windows, the log file is located at `C:\Program files (x86)\Hyper9\Server\logs\hyper9.`

On the appliance, the log file is accessible from the maintenance website.

To access the log file on the maintenance website:

1. Log on to the administration website of SolarWinds Virtualization Manager with your administrator credentials.
Note: Typically, this is `https://hostname:5480` where `hostname` is the host name or IP address of your appliance. Acknowledge the security certificate warning and continue to the website.
2. Click the **SolarWinds Mgmt** tab.
3. Click **View Recent Log Activity**.

Adding an SSL certificate to Virtualization Manager

You can replace the SSL certificate included with Virtualization Manager with one of your own.

Warning: When you use the `su` command (switch user), you open the computer to security risks. It is *not* good practice for numerous people to know the `root` password. When you log in as `root`, you have full system privileges, and you can perform any and all commands. Some of these commands are destructive.

Inexperienced users could cause serious damage to the system. When a user leaves the company, or otherwise should no longer have access to the `root` account, the system administrator should change the `root` password.

Adding a self-signed SSL certificate

To add a self-signed SSL certificate, perform the following steps.

1. Log on to the virtual appliance by using the console or an SSH connection.
2. Enter the following command: `sudo su - root`.
3. Navigate to the java bin folder on the virtual appliance. This is generally found in the `/usr/java/jdkX/bin` folder, where `x` represents the jdk version number.
4. Enter the following command, where `mykeystore` is the name of your new keystore and `daysvalid` is the number of days the certificate is valid:

```
./keytool -genkey -alias tomcat -keyalg RSA -keystore  
/etc/hyper9/mykeystore -validity daysvalid
```

Note: If you use the default keystore, `hyper9-keystore`, you do not need to modify the `server.xml` file.
5. When prompted, enter a new keystore password. This information is necessary for a later step.
6. Enter the information necessary for the new certificate. Provide the following information:
 - Your domain name instead of the first and last name
 - The name of your organizational unit
 - The name of your organization
 - The name of your city or locality
 - The name of your state or province
 - Your two letter country code

This information is displayed to users who attempt to access Virtualization Manager through a secure connection.

If you do not use the domain name for the name, you will continue to receive certificate errors.

7. Type `yes` when prompted to confirm your new key information.
8. When prompted for the key password, enter the keystore password you entered before.
9. Modify the owner of the keystore by entering the following command, where `mykeystore` is the name of your keystore:

```
chown hyper9.hyper9 /etc/hyper9/mykeystore
```
10. Change the permissions on the keystore by entering the following command, where `mykeystore` is the name of your keystore:

```
chmod 755 /etc/hyper9/mykeystore
```
11. Navigate to `/usr/share/tomcat-X/conf`, and create a backup of the `server.xml` file.
Note: If you use the default keystore, `hyper9-keystore`, you do not need to modify the `server.xml` file.
12. Open the `server.xml` file.
13. Edit the connector entity to include the keystore location. The entity should look similar to the following:

```
<Connector port="8443"
protocol="org.apache.coyote.http11.Http11Protocol"
keystoreFile="../../conf/hyper9-keystore"
keystorePass="h9keystore"
SSLEnabled="true"
maxThreads="150"
scheme="https"
secure="true"
clientAuth="false"
sslProtocol="TLS" />
```

14. Save the `server.xml` file.
Note: After an upgrade, the certificate configuration reverts back the default

self-signed certificate. To preserve your configuration, create a backup of the `server.xml` file located in `/usr/share/tomcat-X/conf` under a different name (for example, `server.xml.beforeupgrade`).

15. Restart Tomcat by entering the following command:

```
service tomcat6 restart
```

If you receive "Untrusted site" errors after adding your certificate, see the KB article about [Accepting an Unsigned Certificate](#).

Adding a certificate from a certificate authority

Warning: Even though you can add a certificate from a certificate authority, SolarWinds Technical Support only assists you with adding a self-signed certificate.

If you need clarification, see the Tomcat help page, or the help page of your certificate authority.

To add a certificate from a certificate authority:

1. Log on to the virtual appliance by using the console or an SSH connection.
2. Enter the following command: `sudo su - root`.
3. Navigate to the java bin folder on the virtual appliance. This is generally found in the `/usr/java/jdkX/bin` folder, where `x` represents the jdk version number.
4. Enter the following command, where `mykeystore` is the name of your new keystore:

```
./keytool -genkey -alias tomcat -keyalg RSA -keystore  
/etc/hyper9/mykeystore
```
5. When prompted, enter a new keystore password. This information is necessary for a later step.
6. Enter the information necessary for the new certificate. Provide the following information:

- Your domain name instead of the first and last name
 - The name of your organizational unit
 - The name of your organization
 - The name of your city or locality
 - The name of your state or province
 - Your two letter country code
7. Enter `yes` when prompted to confirm your new key information.
 8. When prompted for the key password, enter the keystore password you entered before.
 9. Modify the owner of the keystore by entering the following command, where `mykeystore` is the name of your keystore:

```
chown hyper9.hyper9 /etc/hyper9/mykeystore
```
 10. Change the permissions on the keystore by entering the following command, where `mykeystore` is the name of your keystore:

```
chmod 755 /etc/hyper9/mykeystore
```
 11. Enter the following command, where `mykeystore` is the name of your new keystore:

```
keytool -certreq -keyalg RSA -alias tomcat -file certreq.csr -keystore mykeystore
```
 12. Submit the CSR to your certificate authority (CA).
 13. After the CA replied to you, copy the certificate and chain certificate to a permanent location in the virtual appliance.
 14. Navigate to the java bin folder.
 15. Import the chain certificate by entering the following command, where `mykeystore` is the name of your new keystore and `chain_certificate_filename` is the name of your chain certificate:

```
keytool -import -alias root -keystore mykeystore -trustcacerts -file chain_certificate_filename
```

16. Import the new certificate by entering the following command, where `mykeystore` is the name of your new keystore and `certificate_filename` is the name of your certificate:

```
keytool -import -alias tomcat -keystore mykeystore -file  
certificate_filename
```
17. Navigate to `/usr/share/tomcat-X/conf`, and create a backup of the `server.xml` file.
18. Open the `server.xml` file.
19. Edit the connector entity to include the keystore location. The entity should look similar to the following:

```
keystoreFile="../../conf/hyper9-keystore"  
keystorePass="h9keystore"  
SSLEnabled="true"  
maxThreads="150"  
scheme="https"  
secure="true"  
clientAuth="false"  
sslProtocol="TLS" />
```
20. Save the `server.xml` file.
21. Restart Tomcat by entering the following command:

```
service tomcat6 restart
```

Collecting data and calculating rollup information

Data in Virtualization Manager is collected in intervals based on collection schedules.

The two primary types of data collection are the following:

- Configuration
- Performance

Configuration data includes properties such as CPU speed, CPU or network interface count, and host name. By default, configuration data is collected in 12 hour intervals.

Performance data includes properties such as total latency, CPU idle, and throughput. By default, performance data is collected in 10 minute intervals. Performance data is collected for new data sources immediately, but is not displayed until configuration data is collected.

If you have calculations based on both configuration and performance data, the configuration data will be older than the performance data and may affect your expected calculations. For example, if you just added a cluster, it may take up to 12 hours (or your configuration collection interval) for the information to appear. To immediately collect configuration information, click **Run Now** in the Collection Schedules section of Virtualization Manager.

To see how specific properties are collected, see the KB article about [Virtualization Manager Properties](#).

You can change the frequency of individual collections by modifying the collection schedule on the Setup tab in the Collection Schedules section.

Sample collection in a VMware environment

The VMware API provides Virtualization Manager with recent sample values every 20 seconds, from approximately the previous hour. The sample data is collected every 20 seconds. This data represents the average value during the given 20 second period.

If the data collection interval in Virtualization Manager is set to the default 10 minutes, Virtualization Manager collects the 20 second samples from the last 10 minutes. This way it gets 30 values for each performance counter. According to the type of the sample value, the average, maximum, or last value is used as the value presented in Virtualization Manager.

Most of the raw values stored in Virtualization Manager are the average values from the data collection interval, that is, the average values during the last 10 minutes by default.

Virtualization Manager also calculates peak sample values. Peak values are the maximum values from the 20 second samples. For example, if the default 10 minute data collection interval is used, the peak value is the maximum value from the 30 values received in the previous 10 minutes. The sample values collected every 20 seconds are not stored in Virtualization Manager, because they represent a big amount of data. These values are used to compute the average or maximum value from out of the raw values.

Sample collection in a Hyper-V environment

Virtualization Manager collects two sets of samples for hosts, clusters, and data stores, with one minute delay between the two sample sets. The average values are calculated from the difference between the two sample sets, and from the time that elapsed between them.

For VMs, the current values are collected, that is, the values that are available at the moment of the request.

As opposed to VMware, there are no peak values calculated for a Hyper-V environment.

Data rollup

Raw performance data is rolled up over time, to provide hourly, daily, weekly, monthly and quarterly averages, maximal, and other statistics. The rollup periods are based on the local server time and do not take business hours into account.

The raw and hourly performance data consumes large amounts of storage capacity, and it is discarded after a configurable amount of time. Higher level rollups are retained indefinitely for record keeping purposes, cost accounting, and to act as a data warehouse. This information provides administrators with long term trends in resource consumption.

Peak values are calculated in the following way:

- Latest Value (peak): The highest values of each sample collected from VMware. VMware collects raw data in 20 second intervals.

- Hourly Rollup (peak): The highest values from the data collected during the last hour.
- Daily Rollup (peak): The highest values from the hourly rollups during the last 24 hour period.
- Weekly Rollup (peak): The highest values from the daily rollups during the last seven days.
- Monthly Rollup (peak): The highest values from the daily rollups during the last calendar month.
- Quarterly Rollup (peak): The highest values from the monthly rollups during the last quarter.

Note: Monthly and quarterly rollups are not generated daily, as this operation would generate a considerable computation load every day.

Although average and peak are the two most common metrics, other metrics collected by the performance job use different rollups. For example, when the Powered On status is rolled up, Virtualization Manager only retains whether the system was mostly on or off during the rollup period.

Data retention

Raw performance data is saved for 14 days, and hourly rollups are saved for 90 days by default. You can change how long Virtualization Manager retains this data under **Setup > Advanced Setup > System Properties**. Increasing the length of time data is retained may slow down the application or the database if you do not provide adequate storage resources. However, any increase to the raw performance data and hourly rollup retention will significantly impact your database size.

This can be configured in **Setup > Advanced Setup > System Properties**.

The following table provides data retention information per rollup period.

| Period | Default retention period |
|--------------------------|--------------------------|
| Latest values (raw data) | 14 days (configurable) |
| Hourly rollup | 90 days (configurable) |
| Daily rollup | Indefinite |
| Weekly rollup | Indefinite |
| Monthly rollup | Indefinite |
| Yearly rollup | Indefinite |

Aggregation

Aggregation combines the performance data collected during the same time across your virtual environment. To calculate overall performance and load statistics for data stores, for example, Virtualization Manager collects partial data from each individual host and VM which accesses the data store, and then aggregates that data to get a complete picture of the load and performance of that data store.

Raw data is aggregated by the collection job in real time. When there are aggregate raw data points, they are stored, processed, indexed, and rolled up by Virtualization Manager.

Infrastructure aging

If no data is collected against a piece of your virtual infrastructure after 24 hours, that piece, or configuration item (CI), is considered "stale," and data relating to it is grayed out. After 48 hours with no data collected, Virtualization Manager considers that CI to be removed from your infrastructure and stops displaying information about it. The data is not deleted from the database, and if the CI reappears in your virtual environment, Virtualization Manager links the new information to the information already gathered in the database.



Chapter 4: Key features

SolarWinds Virtualization Manager is a comprehensive virtual environment management solution that helps you solve VM sprawl, identify performance bottlenecks, plan for changing capacity requirements, and illustrate showback and chargeback. Virtualization Manager is pre-populated with industry best practice-based tools to enable you to more efficiently manage your virtual environment.

Dashboard

The Dashboard area uses widgets to bring you information at a glance regarding performance, capacity planning, VM sprawl, and more. You can customize both dashboards and dashboard widgets to display what is most important to your environment. The dashboard answers high-level questions such as the following:

- Which VMs are experiencing the most latency?
- Which clusters have memory ballooning issues?
- What is my average uptime?
- What is the estimated cost of running a set of VMs in the cloud (EC2)?

Dashboard information is frequently used as a starting point in investigating environmental issues.

Explore

In the Explore area you can quickly view items in your environment, including historical information collected by Virtualization Manager. You can view your environment in the Map, the content stored in Virtualization Manager, historical information for alerts and resources, and more.

Information in the Explore tab helps answer questions such as the following:

- What did my environment look like in the past?
- What details are collected per resource?
- How similar are two resources?

Capacity planning

By using the Capacity Planner tool you can create capacity plans. You can create what-if scenarios, visualize how long you can continue with your current load, or plan when to procure new resources. The Capacity Planner answers questions such as:

- When will I run out of resources?
- What are my resource constraints?
- How many more VMs can I add?

Search

The search engine is the underpinning of many of the tools and customizations that you can perform. Saved search queries can be used to create new reports, alerts, trends, and more.

Common capacity management questions

The following sections briefly demonstrate how to answer management questions with Virtualization Manager. Usually, several tools are used in conjunction to answer questions such as the following:

- [How do I find performance bottlenecks?](#)
- [How can I diagnose historic performance issues?](#)
- [How do I create a virtualization capacity plan?](#)
- [How can I solve VM sprawl, reclaim resources, and rightsize my virtual environment?](#)
- [How much would it cost to move my virtual infrastructure to Amazon EC2?](#)

How do I find performance bottlenecks?

Bottlenecked areas, where a single or limited number of items restrict the performance of a resource, can be identified using the administrator dashboard, alerts, or the Capacity Planner.

The administrator dashboard hosts widgets that monitor various performance contention metrics such as CPU, memory, disk, I/O, and storage metrics. By using the dashboard, you can quickly view which areas per resource may need to be addressed. You can create alerts for other areas that you want to monitor that are not included in the default alerts. By using the Capacity Planner you can proactively identify what will become a bottleneck in the future. For more information, see [Capacity planning](#).

How can I diagnose historic performance issues?

Virtualization Manager collects data and stores it to compile historical information about the resources, which is most effective when enough time has elapsed to create a large base of comparison.

For example, I/O latency data is not available until data has been collected for some time, and the accuracy of the information increases as more data is gathered. You can use the dashboard to look at current trend information, while the historical performance analyzer charts allow more in-depth views to issues and trends in your resources.

For more information, see [Historical performance analyzer charts](#).

How do I create a virtualization capacity plan?

You can use the Capacity Planner to view potential bottlenecks, plan additions to your current infrastructure, or determine when you need to expand your capacity. Information is drawn from your current environment and data sources to compile your current capacity and to predict the potential capacity.

Additionally, you can use the dashboards and alerts to monitor your current capacity for spikes that indicate changing needs.

For more information, see [Capacity planning](#).

How can I solve VM sprawl, reclaim resources, and rightsize my virtual environment?

Virtualization Manager includes a VM sprawl dashboard that displays the number of unused, oversized, and undersized VMs over time along with other metrics useful in effectively utilizing your virtual environment. You can use business views to gather more information about which resources are overallocated and underallocated, which VMs are sized incorrectly, and which VMs are stale.

For more information, see [Business views](#).

How much would it cost to move my virtual infrastructure to Amazon EC2?

Virtualization Manager contains a Cloud Cost (EC2) dashboard which displays data about what it would cost to move your current virtual infrastructure or a specific part of it to Amazon EC2.

Because the costs of using cloud services depend on unique factors, such as the location of the servers, Virtualization Manager does not cover all the possibilities by default in its cloud cost calculation. However, you can modify the algorithm Virtualization Manager uses for the cloud cost calculations to fit your needs.

To find and modify the criteria based on which the cloud costs are calculated:

1. Navigate to **Explore > Content**.
2. Under **Filter content**, open the **by type** accordion, and then select **Trends**.
3. Search for `EC2` to find the relevant EC2 trends you want to modify.
4. Click on the trend you want, and then click **Configure** on the bottom of the screen.
5. Select the Criteria tab of the trend to see the XPath query that is used for calculating the cloud cost.

For example, the criteria for the **EC2 Average Monthly Windows VM Cost** trend is the following:

```
if (/virtualMachine/memory <= 1740.8 and /virtualMachine/cpuCount <=1)
then 87.6 else if
```

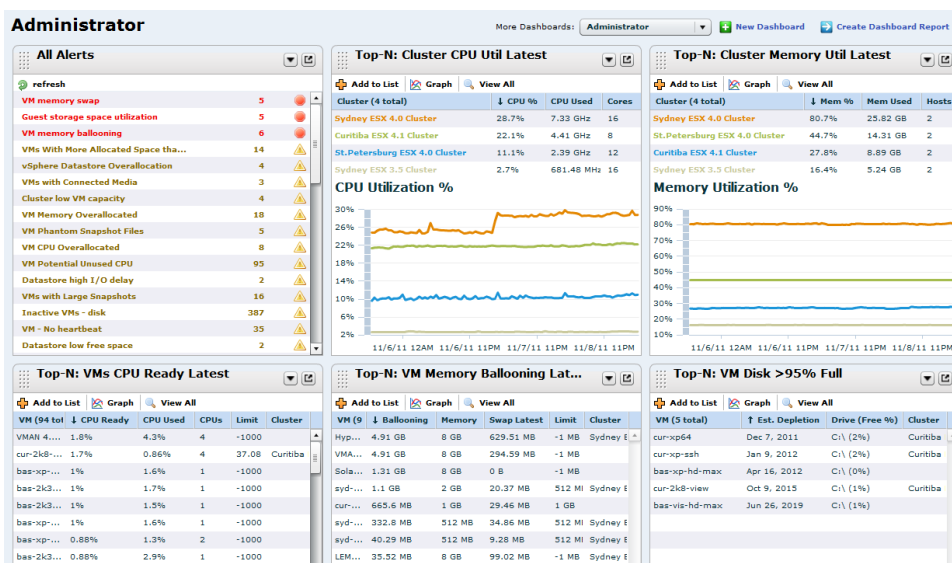
How much would it cost to move my virtual infrastructure to Amazon EC2?

```
(/virtualMachine/memory <= 1740.8 and /virtualMachine/cpuCount <=5) then
211.7 else if
(/virtualMachine/memory <= 7680 and /virtualMachine/cpuCount <=4) then
350.4 else if
(/virtualMachine/memory <= 17510.4 and /virtualMachine/cpuCount <=6.5)
then 452.6 else if
(/virtualMachine/memory <= 15360 and /virtualMachine/cpuCount <=8) then
700.8 else if
(/virtualMachine/memory <= 7168 and /virtualMachine/cpuCount <=20) then
846.8 else if
(/virtualMachine/memory <= 35020.8 and /virtualMachine/cpuCount <=13)
then 1051.2 else 2102.4
```

The first line represents Windows on m1.small instance with 1.8 GiB of memory and one vCPU. The last number is the price per month. To adapt the query to your needs, modify the numbers according to the output of the cloud cost calculator provided by Amazon or other cloud providers.

Chapter 5: Dashboards

Dashboards form a single pane of glass to highlight important information about your virtual environment. Dashboards are customizable.



SolarWinds Virtualization Manager contains a number of default dashboards. Depending on your data sources, not all dashboards are available. To view a different dashboard, select it from the **More Dashboards** list.



To prevent users from modifying dashboards, make the dashboards world readable only: Navigate to **Explore > Content**, and then search for the dashboard whose permission level you want to modify. Select the dashboard, and then click **Edit** (pencil icon) in the lower left. Change the permission to World Readable, and then click **Save**.

SolarWinds Virtualization manager contains the following default dashboards.

Admin - Desktop

Provides a high level view of VMs running a desktop OS and related infrastructure.

Administrator

Provides a quick view of alerts, depleted resources, and virtual environment health for VMware, Hyper-V, or mixed environments.

Capacity Planning

Provides details about resources that are nearly depleted, and provides an overview of the capacity in the virtual infrastructure.

Cloud Cost (EC2)

Provides information about the cost of moving the current virtual infrastructure to Amazon EC2. For more information, see [How much would it cost to move my virtual infrastructure to Amazon EC2?](#)

Cluster Host Health

Provides high level details of the health statistics for cluster hosts in VMware, Hyper-V, or mixed environments.

Manager

Provides a high level view of the size and scope of the virtual environment and its available capacity for VMware, Hyper-V, or mixed environments.

Reporting

Provides trends about how the virtual environment is changing over time.

Showback

Provides a quick view of how the virtual machines are being used over time.

Storage

Provides insight into the virtual environment storage utilization, mostly from the data store point of view.

VM Sprawl

Shows the resources that are currently being wasted by inactive VMs and other virtual infrastructure.

Dashboard basics

You can always return to the dashboards by clicking the logo at the top left of the SolarWinds Virtualization Manager application or by using the **Recent** tab to navigate to the dashboard.

To view a different dashboard, select it from the **More Dashboards** list.

To create a new dashboard, click **New Dashboard**. After naming the new dashboard, it is displayed as an empty dashboard. All new dashboards are empty except for the **Add Widget** placeholder represented by the empty widget with a blue plus sign (+). For information about adding widgets, see [Common widget controls](#) and the following section.

To create a report based on the contents of the current dashboard, click **Create Dashboard Report**.

Dashboards are composed of one or more widgets. A widget is a small window in each dashboard which presents information from the SolarWinds Virtualization Manager system. There is no limit to the number of widgets that you can place on a dashboard. Virtualization Manager contains the following widget types:

- [Alert Monitor widget](#)
- [Consumption widget](#)
- [Content/Alert List](#)
- [Facet View widget](#)
- [Fitment widget](#)
- [Map widget](#)
- [Notes widget](#)
- [Performance Chart widget](#)
- [RSS Feed widget](#)
- [Top N widget](#)
- [Trend widget](#)

Each dashboard contains a final widget with a blue plus sign (+) which you can click to add a new widget to the dashboard. This walks you through the configuration of the new widget depending on its type. Configuration options for each type of widget are covered in the following sections.

Dashboards are another type of content in SolarWinds Virtualization Manager. You can view and manage all of your dashboards in the Content Manager. You can also make a dashboard private to have a highly personalized view of your virtual environment.



To set up a default dashboard for a user, navigate to **Setup > Advanced Setup > Users**, select the user from the list, and then click **Set Default Dashboard**. After selecting the default, the same dashboard will be loaded for the user every time they log in.

Common widget controls

Regardless of the type of widget, the following common controls are displayed at the top of each widget:

- Move -
- Options -
- Open Related -

Moving widgets

To move a widget to a different location on the Dashboard, drag the Move button to the location you want. All other widgets will be reorganized according to the widget you moved.

Displaying widget options

Click the **Options** button to display the following commands:

- **Edit widget:** Edit the options and properties of the widget. In most widgets you can configure the data columns that are displayed in the widget from the **Columns** tab. Other configurable options and properties are covered in the widget descriptions.
- **Export as PNG:** Create a graphics file of the current widget state.
- **Resize:** Resize the widget.
- **Copy Widget Link:** Create a URL for the widget and copy the URL to the clipboard. You can paste the URL from the clipboard to share the widget with others in an email message or web page.
- **Make a copy of this widget:** Create a duplicate of this widget on the dashboard. You can edit the duplicate to make a new version of the widget.
- **Delete:** Remove the widget from the dashboard.

Opening related content

By using the **Open Related** button you can explore the information in your widget on a grander scale.

For example, on the map widget, the **Open Related** button takes you to a full-sized map view. On a Trend widget, the button plots the data on a full-sized business view.

Widget types

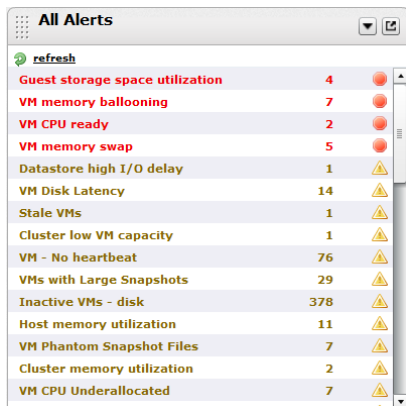
Each widget has its own unique perspective, controls, and configuration options. This section contains information about each widget type in detail.

- [Alert Monitor widget](#)
- [Consumption widget](#)
- [Content/Alert List](#)
- [Facet View widget](#)
- [Fitment widget](#)
- [Map widget](#)

- [Notes widget](#)
- [Performance Chart widget](#)
- [RSS Feed widget](#)
- [Top N widget](#)
- [Trend widget](#)

Alert Monitor widget

By using Alert Monitor widgets, you can view some or all of the alerts configured in SolarWinds Virtualization Manager.



| All Alerts | | |
|---------------------------------|-----|---|
| refresh | | |
| Guest storage space utilization | 4 | ● |
| VM memory ballooning | 7 | ● |
| VM CPU ready | 2 | ● |
| VM memory swap | 5 | ● |
| Datastore high I/O delay | 1 | ▲ |
| VM Disk Latency | 14 | ▲ |
| Stale VMs | 1 | ▲ |
| Cluster low VM capacity | 1 | ▲ |
| VM - No heartbeat | 76 | ▲ |
| VMs with Large Snapshots | 29 | ▲ |
| Inactive VMs - disk | 378 | ▲ |
| Host memory utilization | 11 | ▲ |
| VM Phantom Snapshot Files | 7 | ▲ |
| Cluster memory utilization | 2 | ▲ |
| VM CPU Underallocated | 7 | ▲ |

Alerts are another form of content in the SolarWinds Virtualization Manager system. The bulk of the configuration for an Alert Monitor widget is similar to picking content for a Content Viewer widget.

To add a new Alert Monitor widget:

1. Click the **Add Widget** placeholder.
2. Enter a title and subtitle for the alert widget.
3. Navigate to the Alert tab, and then click **Select an Alert**.
4. Choose an alert. You can filter the number of alerts available for selection by using tags or by searching. You can also view only alerts that you own. To narrow down your view to a smaller set of alerts, create a custom tag in

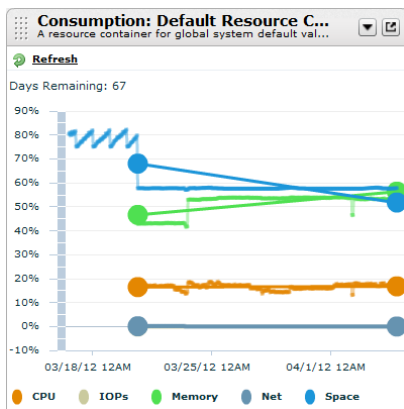
the Content Manager, and then select only that tag.

5. Save the alert.

The only custom control for an Alert Monitor Widget is the **Refresh** link at the top of the widget. This reloads the alerts with their current status.

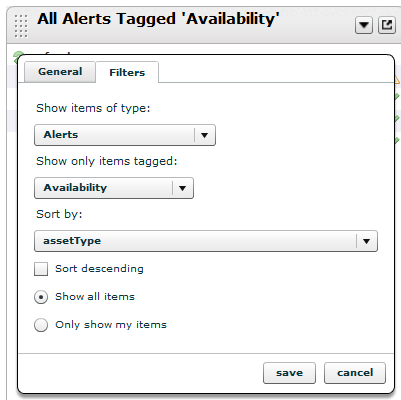
Consumption widget

Consumption widgets show the remaining virtualization resources based on the default usage profile and the default resource container. You can change both the resource container and the usage profile.



Content/Alert List

By using Content/Alert List widgets you can have any content in the SolarWinds Virtualization Manager system available to you on your dashboard. Every piece of content that is displayed in the widget is a link that launches into a detailed view for that type of content.



All content in SolarWinds Virtualization Manager has a type, tags, and an owner. To add a new Content Viewer widget, click the blue plus (+) widget at the end of every dashboard to add the widget manually. Select the type of content and optionally select the content with a given tag to display. Then choose an attribute to sort the content by. You can choose from the following options:

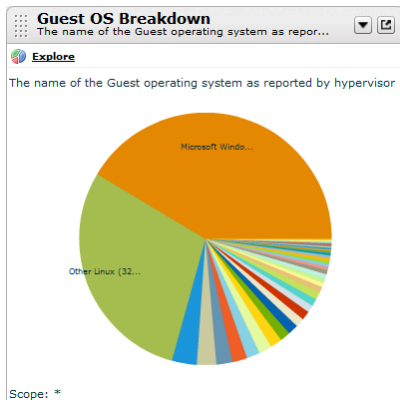
- **assetType:** The type of content
- **dateCreated:** The creation date of the content
- **dateModified:** The last modification date of the content
- **displayName:** The name of the content

You can also choose to see all content visible to you, or only content that you own.

The only custom control for an Alert Monitor Widget is the **Refresh** link at the top of the widget. This reloads the list of content in the widget in case more has been created since the dashboard was last refreshed.

Facet View widget

To create a new Facet Visualization widget, first enter the [Data center visualizer](#) section of Business Views and configure the pie chart. Then click **Add Widget** in the top right of the screen to save the view as a widget. Pick the dashboard in which that widget will reside, and then click **Save**.



You can also click the blue plus (+) widget at the end of every dashboard to add the widget manually. In this process, you are prompted for the Search Query from which you want to facet, and the type of entity (VM, host, datastore, cluster, or application) to search. You can enter the search query manually or load a saved query by using the **Load query** link. Next, select the facet property that will break down the search results into pie sections. You can enter the facet property manually, or click **Select facet** to choose from a list of all facets. Click **Save** to view your new widget, or click **Cancel**.

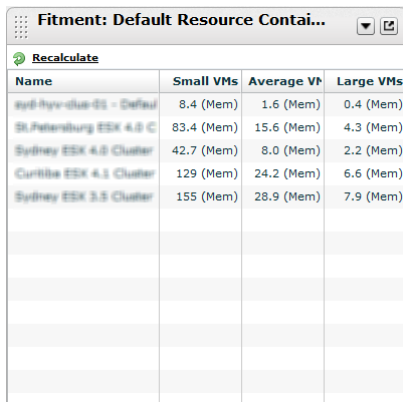
The process of configuring a Facet Visualization Widget is identical to the process of creating a new one except that its current Search Query and facet will be pre-populated.

The last control on the Facet Visualization Widget is the **Explore** link at the top of the widget. Click this link to display a full screen view of that Facet Visualization in the Data Center Visualization section of Business Views.

Fitment widget

By using fitment widgets, you can see the number of VMs that you can add to your various clusters, given the current load on the virtual infrastructure.

Chapter 5: Dashboards



The image shows a Fitment widget titled "Fitment: Default Resource Contai...". It has a "Recalculate" button and a table with four columns: "Name", "Small VMs", "Average VM", and "Large VMs". The table lists five clusters with their respective VM counts in parentheses.

| Name | Small VMs | Average VM | Large VMs |
|--------------------------|------------|------------|-----------|
| spk-hw-clus-01 - Default | 8.4 (Mem) | 1.6 (Mem) | 0.4 (Mem) |
| St.Petersburg ESX 4.0 C | 83.4 (Mem) | 15.6 (Mem) | 4.3 (Mem) |
| Sydney ESX 4.0 Cluster | 42.7 (Mem) | 8.0 (Mem) | 2.2 (Mem) |
| Curitiba ESX 4.1 Cluster | 129 (Mem) | 24.2 (Mem) | 6.6 (Mem) |
| Sydney ESX 3.5 Cluster | 155 (Mem) | 28.9 (Mem) | 7.9 (Mem) |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

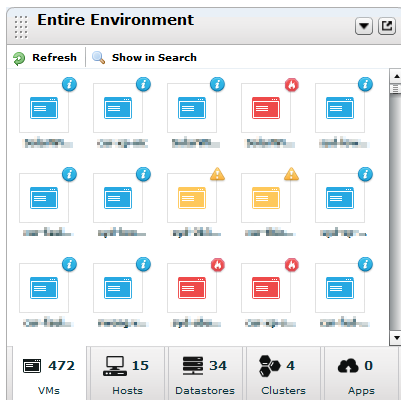
Fitment widgets are driven by a supply side and a demand side. The supply side is a Resource Container and defines the computing resources that are available in one or more hosts or all the hosts in one or more clusters. The demand side is called a Usage Profile and it defines the set of VMs that utilize the computing resources. For more information, see [Capacity planning](#).

To configure a Fitment Widget, click the blue plus (+) widget at the end of a dashboard to add the widget manually. The default view uses the Default (All Clusters) as the resource and the Default (All VMs) as the consumption usage profile. Edit the widget to change the resource, usage profiles, and workload size.

Click **Recalculate** to recompute the capacity plan in the widget.

Map widget

By using the Map widget, you can add a smaller version of the map view directly to your dashboard.




The default map widget view displays all available VMs, hosts, datastores, clusters, and applications. To switch object types, click the object counter at the bottom.

Widget options

Click  > **Edit Widget** to change the context.

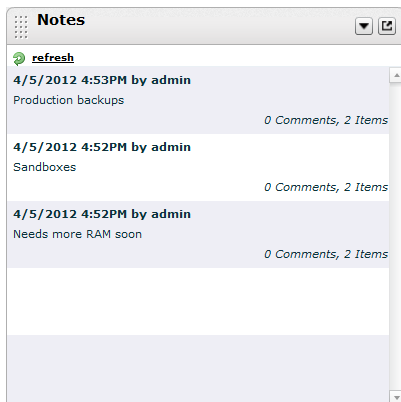
Open related

Click  to open the large map view with the current context.

The **Refresh** link at the top of the widget reloads the list of content in the widget in case more has been created since the dashboard was last refreshed. The **Show in Search** link at the top of the widget opens the selected map view in the search results page.

Notes widget

By using the Notes widget, you can display any notes added to inventory items. This is a convenient way to share team information about past activity or planned future activity. All notes can be displayed on a widget.



Like all content in SolarWinds Virtualization Manager, all notes can be tagged. When adding a Notes Widget, you can select to show all notes in the system, or just notes with a certain tag.

Select the tag of the notes you want to show when creating the widget.

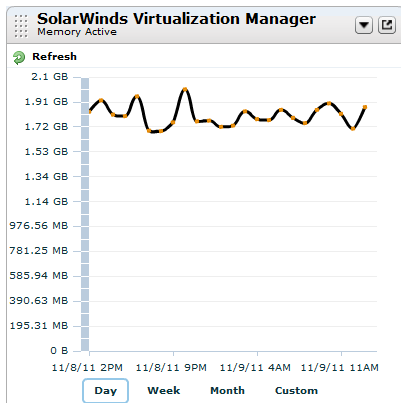
For information about creating notes, see [Notes](#).

Chapter 5: Dashboards


Performance Chart widget

By using the Performance Chart widget you can place metrics on your dashboard.

Note: New chart widgets are empty until you configure the chart details in the options.



Widget options

Click  > **Edit Widget** > **Chart** to select the asset type, the asset, and the metric.

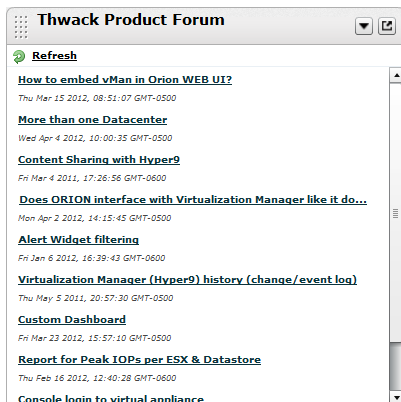
Open related

Click  to plot the current metric on the larger chart view.

RSS Feed widget

By using the RSS Feed widget you can view any RSS feed on the dashboard.

This widget is included by default on the Administrator Dashboard to inform you about company news and product updates.



To configure the RSS Feed Widget, click the blue plus (+) widget at the end of a dashboard, and then provide the URL of the RSS feed you want to view in the widget. Click **Save** to view your new widget.

The only custom control on the RSS Feed widget is the **Refresh** link at the top. Click this link to get a fresh version of the RSS feed and refresh the widget with new content.

Top N widget

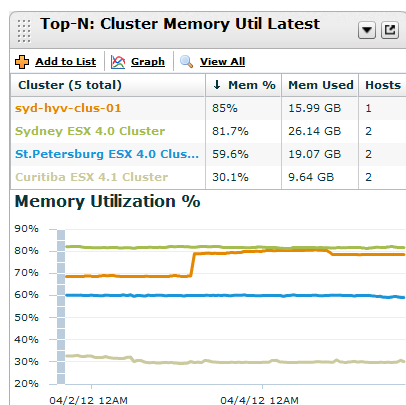
Top N widgets display a short list of virtual entities (VMs, hosts, clusters, data stores, or applications) that are using more resources than their counterparts. Top N widgets without graphs provide more real estate for more results.

Top-N: VMs CPU Ready Latest

[Add to List](#)
[Graph](#)
[View All](#)

| VM (18) | ↓ CPU Ready | CPU Used | CPUs | Limit | Cluster |
|-----------|-------------|----------|------|-------|---------|
| bas-2... | 99.9% | 0.14% | 1 | 1000 | |
| tok-2k... | 8.4% | 7.1% | 1 | -1000 | |
| VMAN ... | 4.2% | 4.8% | 4 | -1000 | |
| tok-xp... | 3.1% | 63.8% | 1 | 45.35 | |
| tok-2k... | 2.2% | 5% | 2 | -1000 | |
| tok-xp... | 1.9% | 77% | 1 | -1000 | |
| tok-xp... | 1.5% | 65.7% | 1 | -1000 | |
| bas-x... | 1.4% | 1.6% | 1 | -1000 | |
| bas-x... | 1.4% | 1.6% | 1 | -1000 | |
| bas-2... | 1.4% | 4.2% | 1 | -1000 | |
| tok-xp... | 1.3% | 65.8% | 1 | -1000 | |
| simdk | 1.3% | 1.7% | 1 | -1000 | |
| bas-vi... | 1.2% | 4.1% | 2 | -1000 | |
| tok-xp... | 1.2% | 65.4% | 1 | -1000 | |

Top N widgets with graphs display both the value of the resource consumed and a historical chart of the consumption of the given resource over time.



To configure a Top N widget, click the blue plus (+) widget at the end of a dashboard to add the widget manually. Then specify the title of the widget, select the type of entity to display, and enter the search query used to get those items. This lets you see all or just a subsection of your virtual environment. You can enter the search query manually, or load a saved query by using the **Load query (optional)** link. Next, select **Pick a sort field** to pick a field that determines how the results are ordered in your Top N widget (ascending or descending).

You can select which columns are displayed by clicking the plus button and adding an attribute. You can reorder or edit the columns after they have been added to the widget. You can optionally select to include a graph with the Top N results by clicking the **Overlay Graph (optional)** link. This displays all the graphs available to display in the widget.

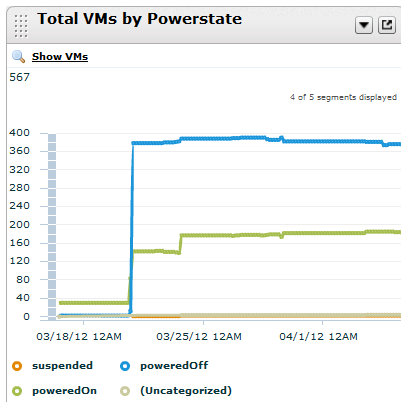
If you create dashboard reports from dashboards with Top-N widgets, you can also choose how many results are displayed in the widget.

By using the custom controls for a Top N widget, you can add the virtual entities to the active list, view the items in the performance analyzer, and run the search in the search results view. The **Graph** link opens the entities in the Performance Analyzer to give you a full screen view of the entities and their resource consumption over time.

Trend widget

By using trend widgets, you can embed a historical trend graph or a multi-trend table into a dashboard.

Historical trend graphs look like the following image:



Multi-trend tables provide a tabular view of trend data:

[illegible]

To create a new Facet Historical Chart widget, find the trend in the Business Views section of SolarWinds Virtualization Manager. When you are viewing the trend, click **Add Widget** in the top right of the screen to save the trend as a widget. Pick the dashboard in which you want to place the widget, and then click **Save**.

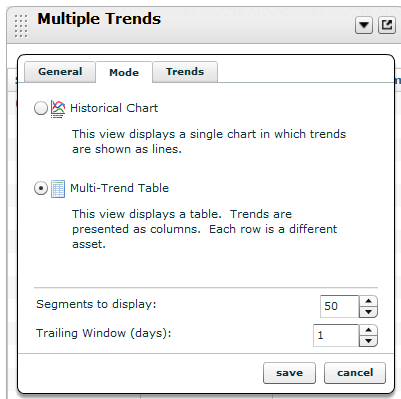
You can also click the blue plus (+) widget at the end of a dashboard to add the widget manually.

On the Mode tab, select **Historical Chart** or **Multi-Trend Table** to determine the widget type.

- **Segments to display:** The maximum number of items to identify in the chart or table.

- **Trailing Window (days):** The amount of history to show on the historical chart.

On the Trends tab, click **Add Trend** to add one or more trends. You can filter the list of trends by tag, ownership, or by a search term.



For Historical Charts, you can choose to **View** the trend in detail. This launches into the trends of Business Views and displays a full screen version of the trend.

Customizing widgets

You can customize widgets from existing widget types. Some widgets can be customized directly from the widget, such as the RSS Feed widget, and some widgets need a custom search query, such as the Top N widget.

For widgets that do not rely on a modifiable query, add the widget and use the **Edit** control to make any necessary changes.

For widgets that rely on a selectable query, first create the query. You can save the query, create a trend from the query, or do both. When you customize the widget, you can select the custom query or the custom trend.

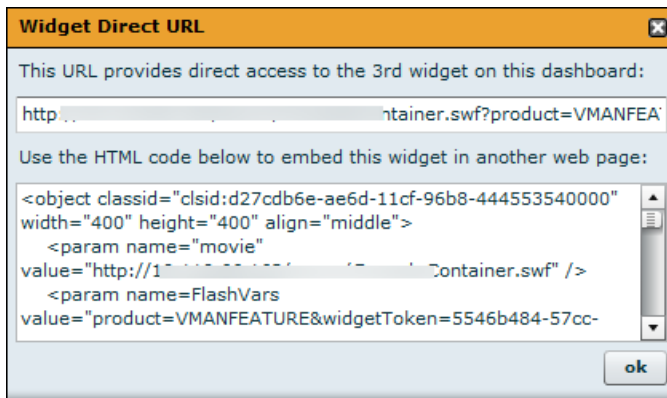
Portal integration

Widgets can be viewed outside of the SolarWinds Virtualization Manager application.

To obtain the URL to embed or link to a widget, click the arrow on the top right of the widget, and then select **Copy widget link**.

This option provides a direct URL to a read-only view of the widget as well as the HTML source code to embed the widget in another web page. The URL is valid for the specific widget spot, not for the specific widget. For example, if you get the URL for the first widget, which could be a Top-N widget, and then you later put a Trend widget in the first spot, the URL will show the Trend widget.

When you embed widgets in other HTML pages, provide at least 354 pixel width. A narrower width may result in scroll-bars placed over the widget.



If you use localhost, the URL you receive is also from localhost, and it is not accessible from the outside. In this case, replace localhost with the real server host name or IP address.

SolarWinds Orion server

SolarWinds Virtualization Manager can integrate with Orion platform products by embedding a widget on a page.

To embed a widget on the SolarWinds Orion server:

1. In Virtualization Manager, click **Copy Widget Link** above the widget.
2. Copy the HTML code.
3. Open your SolarWinds Orion product and navigate to the page from which you want to view your Virtualization Manager widget.
4. Click **Customize Page**.
5. Click the plus sign icon in a column.

6. Group the available resources by type, and then select **Custom Resources**.
7. Select **Custom HTML**, and then click **Add selected resources**.
8. Click **Done** in the Customize Page screen.
9. Click **Edit** on the Custom HTML widget.
10. Paste the HTML code copied from Virtualization Manager.
11. Click **Submit**.

OpenSocial portals

The OpenSocial dashboard standard of Google is a common way to share gadgets. The widgets of SolarWinds Virtualization Manager can be displayed inside of an OpenSocial Gadget. This example uses the Atlassian JIRA project.

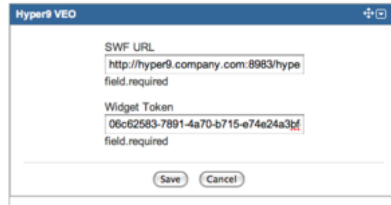
To use a Virtualization Manager widget in an OpenSocial portal:

1. Add the gadget to your directory of gadgets.
2. In JIRA, click **Add Gadget** at the top of any dashboard.
3. Click the **Add Gadget to Directory**.
4. Provide your gadget URL.

Now the SolarWinds Virtualization Manager gadget is ready to be used on your OpenSocial compliant dashboard. In JIRA, click the **Add it Now** button to place an empty gadget on your dashboard, and then complete the following steps to configure the gadget.

1. Click **Edit** at the top of the widget
2. Configure the following two fields:
 - **SWF URL:** This field is where the gadget should look for the flash movie. Use the Widget URL retrieved from Virtualization Manager, but remove everything after the ConsoleContainer.swf. For example,
`http://hyper9.example.com:8983/hyper9/ConsoleContainer.swf`.

- **Widget Token:** This field is for the unique token for the widget. This is the last section of the widget URL after the = symbol.



The screenshot shows a window titled "Hyper9 VEO" with two text input fields. The first field is labeled "SWF URL" and contains the text "http://hyper9.company.com:8983/hype". Below this field is the text "field.required". The second field is labeled "Widget Token" and contains the text "06c62583-7891-4a70-b715-e74e24a3bf". Below this field is the text "field.required". At the bottom of the window are two buttons: "Save" and "Cancel".

3. Click **Save** to display the gadget.

The result is a Virtualization Manager widget inside an OpenSocial portal.

Microsoft SharePoint

Microsoft SharePoint restricts flash content that can be placed into a generic HTML page editor. Complete the following steps to add the widget flash movie to your SharePoint page as a Web Part. These directions were constructed using SharePoint 2010, but they also apply loosely to SharePoint 2007 in the sense that you must edit the HTML source of a Content Editor Web Part.

1. Open the page in SharePoint that you will be editing.
2. Go to **Site Actions > Edit Page**.
3. Under **Editing Tools** at the top of the screen, click **Insert**.
4. From the **Insert** menu, select **Web Part**.
5. Select **Media and Content**, and then add a **Content Editor** type to your page.
6. Highlight the Content Editor on your page, and then click **Format Text** under the **Editing Tools** header.
7. Select **HTML > Edit HTML Source**.
8. Use the embeddable HTML source code from the **Get Widget URL** window to embed your widget in your SharePoint page as a Web Part.

Chapter 6: Business views

Business Views provide graphical representations of virtual infrastructure trends, historical performance, and make-up. They give a high level overview of the current performance and composition of your data center so that you can make business decisions about capacity planning, chargeback, and system security. Business Views have the following two aspects:

- [Trends](#) - 
- [Data center visualizer](#) - 

To reach the Business Views, click the Reporting tab, and then click **Business Views** in the top menu.

Note: The [Historical performance analyzer charts](#) are no longer a section of the Business Views. You can see performance charts from anywhere by clicking **Add to Chart** when you have one or more objects selected.

Trends

Data centers undergo constant change, and SolarWinds Virtualization Manager constantly collects and monitors configuration and performance data over time. The Global Trends aspect displays high level changes of your environment over time. Upon installation, the SolarWinds Virtualization Manager system begins tracking over 70 trends that are contained within the product.

To access the Global Trends:

1. Click **Reporting > Business Views**.
2. Click the line chart icon on the top left.

By default, each trend runs a search every four hours and records the result. The result may be a count of the number of results returned, or a value based on data

within each search result. You can change the default four hour interval to run searches more or less often, but this value typically should be the same as the configuration collection interval, because most trends are based on configuration data. You can change the default interval for the Hourly Interval for Trend Execution property in the System Properties screen. For more information, see [Configuring system properties](#).

Trend operations

You can perform the following operations with the currently loaded trend using the links in the top right corner of the Trend screen:

- **Add Widget:** Creates a widget view of the trend, showing a maximum of four segment lines, on a dashboard of your choice.
- **Save Report:** Generates an Excel spreadsheet that contains all data points for all segments in the current view of the trend.
- **Search:** Executes the search that powers the trend, and shows the results on the Search page.
- **Configure:** Opens the configuration page where you can edit the trend. For more information about the configuration options of trends, see [Creating trends](#).

Creating trends

Apart from the trends that are available by default, you can also create your own trends.

To create a trend:

1. Perform a search.
2. Click **Trend Results** to access the Trend creation screen.



To avoid building trends from scratch, you can base new trends on already existing ones. Choose a trend under **Explore > Content**, and then modify the evaluation criteria to suit your needs.

The Trend creation screen consists of the following tabs:

- **Scope:** On this tab, the item type is automatically selected, and the Search Query field is pre-populated according to the search query you used.
- **Criteria:** To trend the number of search results over time, select **Search result count**. To pull data out of each search result, instead of just using the count of search results, you have two options:
 - Select **Attribute** in the Criteria tab, and then type the name of the attribute you want to base the trend on. The autocomplete function suggests options based on what you have typed so far. To select from all the available attributes, click **Find**.
 - Use XPath in the **Attribute** field. This requires familiarity with the SolarWinds Virtualization Manager configuration model, but provides a powerful way to do math operations on multiple values to return the attribute value.

Whether you use XPath, or select an attribute, make sure that you select the appropriate unit from the **Units** list for the data you want to pull. Also make sure that you choose a value from the **Aggregation Function** list to specify whether you want to count the number of values, the total (sum) of the values, or the minimum, maximum or average of values.

- **Segmentation:** To create a trend with multiple lines that are segmented by some attribute, type the name of an attribute in the **Segmentation** field, or click **Find** to select from the list of available attributes. Each unique value in the **Segmentation** field results in a different line in the trend. For instance, to see the total disk space used for each operating system, create a

segmentation for the operating system so that you see one trend line per segmenting value.

After you finished setting up the details of the new trend, click **Preview** at the bottom of the screen to see the set of values that will be saved as trend values if you decide to run the trend. If the preview shows that the trend is set up correctly, click **Save** to persist the trend with a new name and an optional description, and begin tracking data center changes.

Data center visualizer

Some properties of the items in the virtual infrastructure have a finite number of available options for values. These are called facets in SolarWinds Virtualization Manager. In the Data Center Visualizer you can display pie chart breakdowns of your inventory according to these facets.

To get to the Data Center Visualizer:

1. Click **Reporting > Business Views**.
2. Click the pie chart icon in the top left.

To view a different property as a facet:

1. If the list of facets is not displayed by default, click **Facets** under **Configuration Explorer**.
2. Select the facet from the list.

A new pie chart is displayed, showing all the unique values for that particular property in Virtualization Manager. Hover over a section of the chart to see the corresponding value, and the number of entities that make up the section. To bring the entities of a pie chart up as search results, click **Search** in the top right. This way you can get a quick breakdown of your data center, and see what entities make up each segment of the pie chart.

After clicking a pie section, you can use the **Sort Selected Facet By** controls in the top left. These controls hold all custom labels that you defined, and they

display how an individual pie section breaks down according to a custom label. For example, if you have a custom label defined for each department, you can see the breakdown of the pie section according to this label by completing the following steps:

1. Click a pie section in the vm.host.hostname facet.
2. Select the "Department" custom field in the top left.
3. Click **Apply**.

As a result, the departments that have VMs on the host that you selected in the pie chart are displayed.

To save the newly created visualization of your data center, click **Add Widget** in the top right to save it to one or more of your dashboards.

Historical performance analyzer charts

SolarWinds Virtualization Manager collects performance data frequently and stores that data over time. As a result, all performance data can be visualized over time. A subset of the data that is available to graph includes the following:

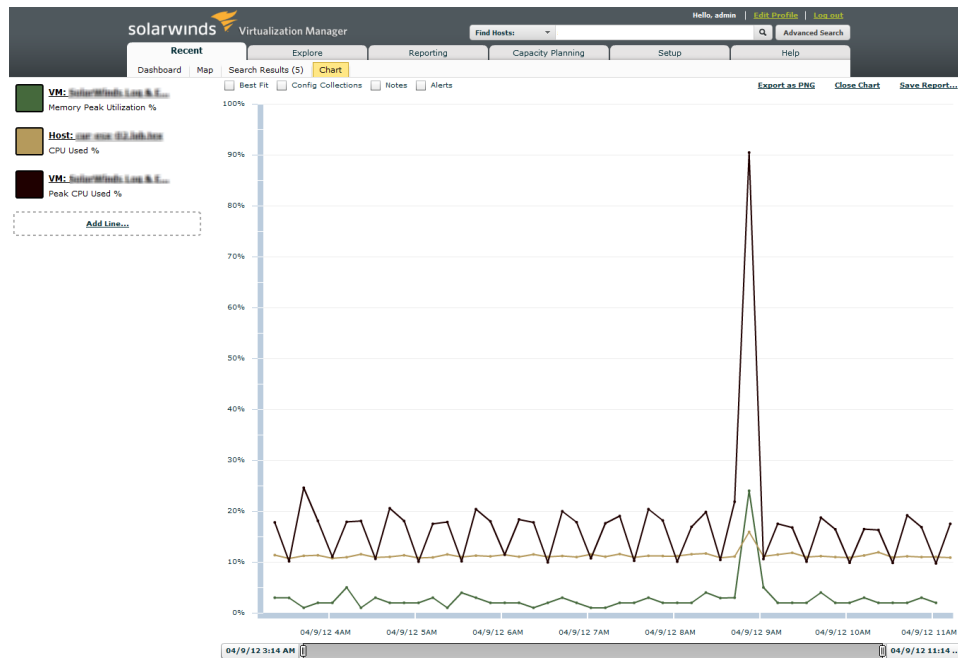
- CPU Ready
- CPU Used
- CPU Wait
- IOPs (Input/Output per second)
- Memory Active
- Memory Ballooning
- Memory Consumed
- Memory Swap In
- Memory Swap Out
- Memory Utilization %

Chapter 6: Business views

- Net Packets Rx
- Net Packets Tx

To view data for any object, select one or more objects, and then click **Add to Chart**.

This takes you directly to the performance chart.




To add additional lines for comparison:

1. Click **Add Line** in the leftmost portion of the Performance Analyzer.
2. Select the line from the list.

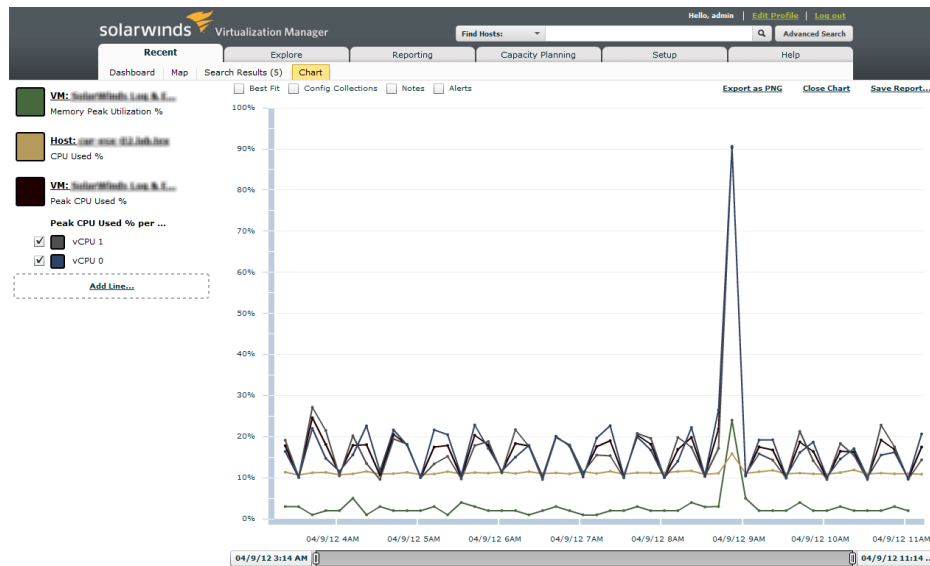
To change the time frame of the chart, click the start and end dates at the bottom of the Performance Analyzer.

Graphed objects can have additional graph controls:

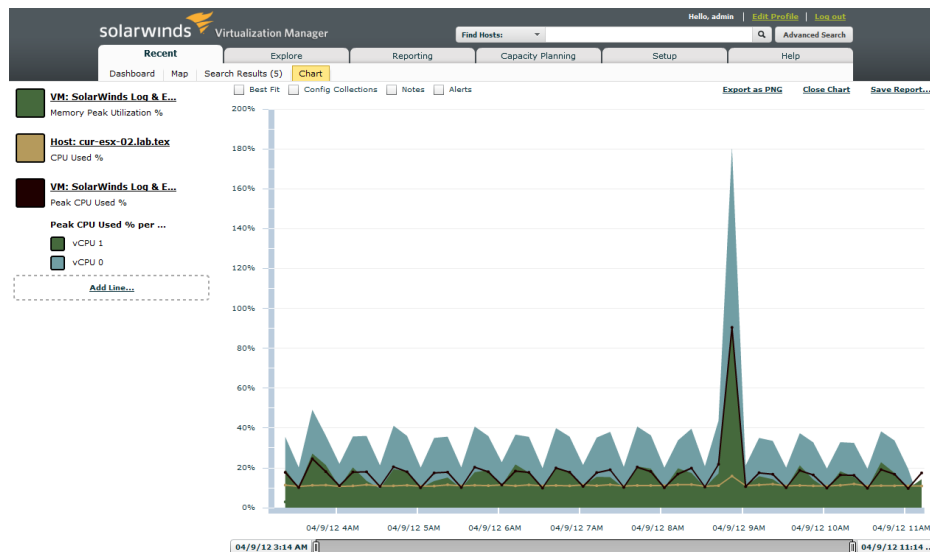
- : Click this control to open a dialog box to add lines from this VM, its parent cluster, its parent host, or related data stores.

Historical performance analyzer charts

- ✚: Click this control to view the individual component values that determine the overall value of this line. For example, viewing the component values for CPU usage displays the individual vCPU cores. If the line is made up of multiple components, only eight components are displayed on the chart.



- 📊: Click this control to view the component values as a stacked chart.



Capacity planning

All lines on the performance charts include an optional "best fit" line that shows a flat line which best fits the points for that metric. To see the best fit line, select the **Best Fit** option at the top of the chart.

The best fit line is based on a classic least squares linear regression calculation of the data points. It is only meaningful if there is an underlying long term trend in resource utilization. For some resources, for example, disk space, this is almost inevitable. For others, for example, CPU, it only applies if the externally applied system load is driving a trend in the data set. The calculation is done on the data range selected in the graph. Hover over the best fit line to see the following values:

- Gradient is the slope of the line, it displays the rate of growth of the performance metric or trend.
- r^2 is the r-squared coefficient of determination. The range of possible values is 0.0 to 1.0. A higher value means that the data better fits a straight line projection with growth over time. Do not lend too much weight to this value if there is only a small number of data points in the graph. For example, if there are only two data points in the graph, the value of r^2 will always be 1.0. A low value of r^2 indicates either a lot of variability in the data, or that the data do not change significantly with time. Either of these cases means that extrapolating a "drop dead" date on the specific resource is invalid.

For any metric that is a percentage of total resources, the best fit line also includes an estimate for when that value will reach 100%. This gives you a predictive analysis of how your resources are trending over time, so that you can plan when to insert more resources.

Overlays

At the top of the Performance Analyzer chart there are other options that control data that can be overlaid on top of the time line in context of the lines being displayed.



- **Config Collections:** Displays an overlay of the configuration collection times.
- **Notes:** Displays an overlay of notes.
- **Alerts:** Displays a historical overlay of alert notifications.



Chapter 7: Search

The search engine of Virtualization Manager has been specifically tailored to handle the challenges posed by searching large, in-depth, unstructured information sets, such as the data created from an operational virtualized environment. You can create search queries for any items of interest within the entire scope of the virtualized environment. This includes searching for both the performance and configuration details of the following item types:

- vCenters
- clusters
- data stores
- hosts
- applications
- virtual machines

The installation and configuration process facilitates the establishment of a data collection process for the defined Virtual Center servers and unmanaged hosts. This process consists of the following parts:

- It leverages the vendor supplied APIs to access all available data provided for these objects.
- A discovery process enumerates and explores the configurations of virtual machines, hosts, data stores, and clusters.
- A Windows Management Instrumentation (WMI) interrogation of the virtual machines augments this data set.

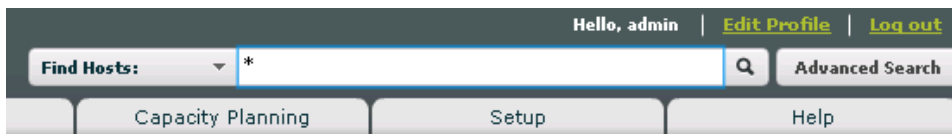
The entire process of data collection is repeated at periodic intervals. The end result is a data repository that accurately represents the configuration, state,

performance, and utilization of the virtual infrastructure. This data repository is queried by the search service of Virtualization Manager, and the data is available for analysis.

Several items on the dashboard perform a search and show results on the search page. The query for the search is pre-populated in the search bar. Many times, you can edit this search to modify the results. However, you can also create search queries from scratch. For more information, see [Searching for objects in Virtualization Manager](#).

Searching for objects in Virtualization Manager

The Search bar is located at the top of the Virtualization Manager user interface.



The previous image shows a simple query, "*".

To start a search:

1. Select the type of objects from the list you want to search for. You can search for applications, clusters, datastores, hosts, and VMs.
2. Type the search query in the search bar.
3. Click **Search**, or press **Enter**.



For example, to search for nodes which have been added to the system recently, execute the following search query:

```
vm.internal.dateCreated:[now-7days TO *]
```

After executing the query, you can build alerts based on the search results. For more information, see [Alerts](#).

To save an executed search query:

1. Click **Save as** at the bottom of the main interface.
2. Specify the name, description, tags, and permissions for the search.

Use the permission settings to specify the sharing of the search query with other Virtualization Manager users.

You can choose from the following permission types:

- **Private:** Only the user saving the search query has access.
- **World Writable:** All users can view and modify the query.
- **World Readable:** All users can view the query.

To execute a saved search:

1. Click **Load** in the bottom right of the main interface. The saved queries in your private folders are displayed by default.
2. Search for a saved query by name, or filter by tags for a saved query.
3. Click **OK** to execute the search.

Search details

Click any search result to open the Search Details page. For each type of search result the details differ, but there are important details to help you understand the importance of a particular item to the virtual environment.

The left column displays the vital performance metrics of the item, and alerts about its performance. Click an alert to see the corresponding details. The icon indicates the importance of the alert.

The right column displays the relationship of the particular item to the other members of the virtual infrastructure. Click any of these items to open it on the search details page.

Search result actions

Select the check boxes next to one or more search result to see the available actions that you can execute on them.

The action buttons launch into a new module of Virtualization Manager with the selected search results in context. The possible actions are the following:

- **Add to List:** Adds the search results to the Active List.
- **Add Note:** Places a custom note on the selected search results.
- **Add to Chart:** Opens the Performance Analyzer with the selected search results in context to view graphs of performance metrics over time.
- **Map:** Displays a dependency map of the virtual infrastructure with the selected search results in context.
- **View Notes:** Displays any custom notes on any of the selected search results.
- **Export:** Performs data export to create a spreadsheet that contains details about the properties of the selected search results.
- **Plan:** Creates a capacity plan using the selected search results.
- **Add to App:** Groups the VM search results together into an application. This action is only applicable to VM search results.
- **Compare:** Performs a DNA comparison between one or two selected search results.
- **Label:** Adds or edits the labels attached to the selected search results.

Note: The action buttons are only displayed after you select one or more search results.

Search query actions

The search query you specify can be used to power other areas of Virtualization Manager. Usually, the search query is entered in the search bar and executed with the **Search** button. After you have found a query that you want to use as the

basis for other activities, such as creating trends, alerts, or performance charts, or for data export, select an action.

The search query actions are the following:

- **Create Alert:** Creates a new alert based on the search query.
- **Trend Results:** Creates a new trend based on the search query.
- **Export Results:** Creates a spreadsheet of properties from the search results in the Data Export module.
- **Plan:** Creates a capacity plan from the search results.
- **Explore Facets:** Opens the Data Center Visualizer with the search results from the search query in context.

Search language

The Virtualization Manager search language is a powerful search syntax with which you can create multi-clause, proper-name, instance-based search queries. Queries are composed of terms and operators. A term can be a single term or a phrase. A single term is a single word such as “windows” or “west”. A phrase is a group of words surrounded by quotation marks, such as “windows west”.

Multiple terms can be combined with Boolean operators to form more complex queries. If there are multiple terms, they are implicitly joined together with AND clauses meaning that all clauses must be true for the search results.

The following advanced search syntax elements are also supported:

- [Wildcards](#)
- [Fuzzy searches](#)
- [Proximity searches](#)
- [Range queries](#)
- [Term relevance boosting](#)

Language syntax

The following sections contain information about the Virtualization Manager search query language elements, and about their usage.

Terms

There are two types of terms: single terms and phrases. A single term is a single word such as "vm" or "west". A phrase is a group of words surrounded by quotation marks, such as "vm west". You can combine multiple terms together with Boolean operators to form a more complex query.

Fields

SolarWinds Virtualization Manager supports fielded data. When performing a search you can either specify a field, or use the default field. You can search any field by typing the field name followed by a colon, and then the term you are looking for.

For example, SolarWinds Virtualization Manager may contain two fields, host and text, and text is the default field. In this case, to find the virtual machine named "River Ranch" which contains the text "Windows Server 2008", enter either one of the following queries:

```
VM:"River Ranch" AND text:"Windows Server 2008"
```

or

```
VM:"River Ranch" AND "Windows Server 2008"
```

Because text is the default field, the field indicator is not required.

Note: The field is only valid for the term that it directly precedes, so the query

`VM:River Ranch` only finds VMs named "River". It finds "Ranch" in the default field, in this case, the text field.

Using wildcard searches

SolarWinds Virtualization Manager supports single and multiple character wildcard searches within single terms, but not within phrase queries. To perform a single character wildcard search, use the "?" symbol. To perform a multiple character wildcard search, use the "*" symbol. The single character wildcard

search looks for terms that match the search term with the single character replaced. For example, to search for "ESX3.0.1" or "ESX3.0.2" you can use the following search:

```
ESX3.0.?
```

Multiple character wildcard searches look for 0 or more characters. For example, to search for ESX, ESX3.0.2 or ESX3.5, you can use the following search:

```
ESX*
```

You can also use wildcard searches in the middle of a term. For example:

```
ESX*2
```

Note: You cannot use a * or ? symbol as the first character of a search.

Using fuzzy searches

SolarWinds Virtualization Manager supports fuzzy searches based on the Levenshtein distance algorithm. The Levenshtein distance is a metric for measuring the amount of difference between two sequences, that is, the edit distance. The Levenshtein distance between two strings is given by the minimum number of operations needed to transform one string into the other, where an operation is an insertion, deletion, or substitution of a single character.

To do a fuzzy search, use the tilde (~) symbol at the end of a single term. For example, to search for a term similar in spelling to "SQL" use the fuzzy search:

```
SQL~
```

This search finds terms such as "PQL" and "TQL". An optional parameter can specify the required similarity. The value is between 0 and 1. If the value is closer to 1, only terms with a higher similarity will be matched. For example:

```
SQL~0.8
```

The default that is used if the optional parameter is not given is 0.5.

Using proximity searches

By using proximity searches, you can find words that are within a specific distance away. To do a proximity search, use the tilde (~) symbol at the end of a phrase. For example, to search for "Microsoft" and "Server" within 10 words of each other in a document, use the following search:

```
"Microsoft Server"~10
```

Using range searches

By using range queries, you can match documents whose field values are between the lower and upper bound specified by the range query. Range queries can be inclusive or exclusive of the upper and lower bounds. Sorting is done lexicographically. For example, the following query finds documents whose `mod_date` fields have values between 20020101 and 20030101, inclusive:

```
mod_date:[20020101 TO 20030101]
```

You can also use range queries with non-date fields. The following query finds all VMs whose names are in the range between DB01 and DB10, but not including DB01 and DB10:

```
VM:{DB01 TO DB10}
```

Note: Inclusive range queries are denoted by straight brackets. Exclusive range queries are denoted by curly braces.

Using date searches

SolarWinds Virtualization Manager supports searching for both specific dates and relative dates.

Specific date searches can be in the following formats:

```
vm.internal.datecreated:YYYY-MM-DD  
vm.internal.datecreated:MM-DD-YYYY
```

The part separator can be either a dash (-), a slash (/) or a period (.).

Searches using either format or any part separator return the same VMs.

Use the following terms to include dates relative to now:

- YEAR **or** YEARS
- MONTH **or** MONTHS
- DAY, DAYS, **or** DATE
- HOUR **or** HOURS
- MINUTE **or** MINUTES
- SECOND **or** SECONDS
- MILLI, MILLIS, MILLISECOND, **or** MILLISECONDS

Boosting a term

Virtualization Manager provides the relevance level of matching documents based on the terms found. To boost a term, use the caret (^) symbol with a boost factor (a number) at the end of the term you are searching. The higher the boost factor, the more relevant the term will be.

You can control the relevance of a document by boosting its term. For example, if you are searching for `Microsoft Windows`, and you want the term "Microsoft" to be more relevant, boost it by using the ^ symbol along with the boost factor next to the term. For example:

```
Microsoft^4 Windows
```

The previous search query makes documents with the term "Microsoft" appear more relevant. You can also boost phrase terms as in the following example:

```
"Microsoft Windows"^4 "Server 2003"
```

By default, the boost factor is 1. Although the boost factor must be positive, it can be less than 1, such as 0.2.

Using Boolean operators

By using Boolean operators, you can combine terms through logical operators. You can use the following Boolean operators in Virtualization Manager:

- AND
- +
- OR
- NOT
- -

Note: Boolean operators must be all capitals.

OR

The OR operator is the default conjunction operator. This means that if there is no Boolean operator between two terms, the OR operator is used. The OR operator links two terms and finds a matching document if either of the terms exists in the

document. This is equivalent to a union using sets. You can use the || symbol in place of the word OR. To search for documents that contain either "Microsoft Windows" or just "Microsoft", use either of the following queries:

```
"Microsoft Windows" Microsoft
"Microsoft Windows" OR Microsoft
```

AND

The AND operator matches documents where both terms exist anywhere in the text of a single document. This is equivalent to an intersection using sets. You can use the && symbol in place of the word AND. To search for documents that contain "Microsoft Windows" and "SQL Server", use the following query:

```
"Microsoft Windows" AND "SQL Server"
```

+

The "+" or required operator requires that the term after the "+" symbol exist somewhere in a field of a single document. To search for documents that must contain "Microsoft" and may contain "Windows", use the following query:

```
+Microsoft Windows
```

NOT

The NOT operator excludes documents that contain the term after NOT. This is equivalent to a difference using sets. You can use the ! symbol in place of the word NOT. To search for documents that contain "Microsoft Windows" but not "SQL Server", use the following query:

```
"Microsoft Windows" NOT "SQL Server"
```

Note: The NOT operator cannot be used with just one term. For example, the following search does not return any results:

```
NOT "Microsoft Windows"
```

-

The "-" or prohibit operator excludes documents that contain the term after the "-" symbol. To search for documents that contain "Microsoft Windows" but not "SQL Server" use the following query:

```
"Microsoft Windows" -"SQL Server"
```

Grouping

You can use parentheses to group clauses to form sub-queries. This can be useful to control the Boolean logic for a query. To search for either "Microsoft" or "VMware" and "Server", use the following query:

```
(Microsoft OR VMware) AND Server
```

The previous query eliminates any confusion, and makes sure that a server must exist, and that either the term Microsoft or VMware may exist.

Field grouping

You can also use parentheses to group multiple clauses to a single field. To search for a VM that contains both the word "Server" and the phrase "Oracle Database", use the following query:

```
VM:(+Server +"Oracle Database")
```

Escaping special characters

To escape special characters that are part of the query syntax, type a backslash (\) before the special character. The current list of special characters is the following:

```
+ - && || ! ( ) { } [ ] ^ " ~ * ? : \
```

Search query examples

You can search for applications, clusters, data stores, hosts, and virtual machines in SolarWinds Virtualization Manager. The following table contains examples of the search queries you can execute. The examples listed in the table are search queries for virtual machines, but the search language is the same for other types of entities.

| Search query | Results |
|-----------------------------|---|
| * | A list of all virtual machines in the SolarWinds Virtualization Manager data repository |
| "vm.name:rcarecords-2-test" | Returns all VMs |

| Search query | Results |
|---|---|
| | named <i>rcarecords-2-test</i> |
| <i>rca</i> * | Returns all VMs with any data containing a word starting with <i>rca</i> |
| <i>rcarecords-?-test</i> | Returns VMs named <i>rcarecords-X-test</i> where X can be any character |
| <i>rcarecords~</i> | Returns VMs with any data containing strings similar to <i>rcarecords</i> |
| vm.environmentFor.diskVolume.freeSpace: [0 TO 10000000] | All VMs whose disk volumes have 0 to 1000000 bytes free space, not including 0 or 1000000 |
| "Microsoft Windows"^4 "Server 2003" | All VMs with <i>Microsoft Windows</i> and <i>Server 2003</i> in the OS details, where <i>Microsoft Windows</i> is 4 times as relevant as <i>Server 2003</i> |
| Server OR Workstation | Any VMs with any data containing the string <i>Server</i> or <i>Workstation</i> |
| Server AND Mail | Any VMs with any data containing the string <i>Server</i> and <i>Mail</i> |

| Search query | Results |
|--------------------------|--|
| +Mail Server | Any VMs with any data that must contain the string <i>Mail</i> but may also contain the string <i>Server</i> |
| Mail NOT Server | Any VMs with any data that may contain the string <i>Mail</i> but may not contain the string <i>Server</i> |
| -Mail Server | Any VMs with any data that must not contain the string <i>Mail</i> but may contain the string <i>Server</i> |
| (Mail OR Web) AND Server | Any VMs with any data that may contain the string <i>Mail</i> or <i>Web</i> in combination with the string <i>Server</i> |

Named fields

Named fields provide a mechanism to search over the specific attributes associated with virtual machines, hosts, data stores, clusters, and applications. Named fields operate as facets do, by adding attribute filters to the search language. You can enter named fields by specifying the exact property to target in the search. Searches for named fields use the following syntax:

```
CI_TYPE.PROPERTY.SUB_PROPERTY:VALUE
```

The CI_TYPE can be one of the following:

- vm = Virtual Machine
- host = Host Server
- cluster = Cluster
- datastore = Datastore

Chapter 7: Search

Not all properties have a sub-property, therefore many named field searches use the following syntax:

```
CI_TYPE.PROPERTY:VALUE.
```

Example search queries

The following section contains examples of the search syntax.

```
vm.cpuCount:2 AND vm.memory:1024
```

This query searches for all virtual machines with two CPUs and 1024 MBs of memory as configured. The usage of MBs as the unit of measure for the memory field is specific to the named field implementation.

You can also use more complex named field structures. They are based on dot notation hierarchies as in the following example:

```
vm.environmentFor.networkAdapters.defaultGateway.ipV4Address:192.0.2.1
```

This query searches for virtual machines whose network adapter's default gateway is set to 192.0.2.1.

Named fields can also be composed of query sub-clauses and any other additional search language features as in the following example:

```
vm.cpuCount:2 AND vm.memory:(1024 OR 2048)
```

In this example, the query searches for all virtual machines with two (2) CPUs and 1024 or 2048 MBs of memory as configured.

If a named field value contains special characters, it must be enclosed in quotes. For example, the following query returns disk drives that are labeled "Hard", and not "Hard Disk 1":

```
vm.environmentFor.diskVolume.label:Hard Disk 1
```

The correct version of the previous query is the following:

```
vm.environmentFor.diskVolume.label:"Hard Disk 1"
```

The following table contains an abbreviated list of fields and their description, including the associated unit of measure.

| Named field (without "vm." qualifier) | Description |
|---------------------------------------|-------------|
| cpuCount | Number of |

| Named field (without “vm.” qualifier) | Description |
|---------------------------------------|--|
| | vCPUs configured |
| diskDrives.capacity | Capacity of configured virtual disk in MBs |
| diskDrives.label | Name of configured virtual disk |
| environmentFor.cpus.description | Description of CPU |
| environmentFor.cpus.deviceId | Processor number |
| environmentFor.cpus.manufacturer | Manufacturer of CPU |
| environmentFor.cpus.name | Name of CPU |
| environmentFor.cpus.processorId | ID of processor |
| environmentFor.cpus.socket | Socket number of CPU |
| environmentFor.cpus.speed | Speed of CPU in MHz |

| Named field (without “vm.” qualifier) | Description |
|---|--|
| environmentFor.networkAdapters.defaultGateway.ipV4Address | IP address of default gateway for NIC |
| environmentFor.networkAdapters.dnsServers.ipV4Address | IP address of DNS server associated with NIC |
| environmentFor.networkAdapters.ipAddress.ipV4Address | IP address of NIC |
| environmentFor.networkAdapters.macAddress | MAC address of NIC |
| environmentFor.networkAdapters.name | Name of NIC |
| environmentFor.networkAdapters.status | Status of NIC |
| environmentFor.networkAdapters.type | Type of the NIC |
| environmentFor.removableDrives.attachedMedia | Label or location of media present in removable device |
| environmentFor.removableDrives.removableDriveType | Type of removable |

| Named field (without “vm.” qualifier) | Description |
|--|---|
| | device |
| environmentFor.runningOS.computerName | NetBIOS name for Guest OS |
| environmentFor.runningOS.currentTimeZone | Current time zone enabled for Guest OS |
| environmentFor.runningOS.daylightInEffect | Whether daylight savings time is in effect for the Guest OS |
| environmentFor.runningOS.dnsHostname | Host name in DNS of Guest OS |
| environmentFor.runningOS.ntDomain | Windows NT domain membership of Guest OS |
| environmentFor.runningOS.oemInfo.description | Information provided by VMware |
| environmentFor.runningOS.osType | Type of Guest OS |

| Named field (without “vm.” qualifier) | Description |
|---|--|
| environmentFor.runningOS.paeEnabled | Whether physical address memory extensions are enabled in Guest OS |
| environmentFor.runningOS.partOfDomain | Whether the Guest OS is part of a Windows NT domain |
| environmentFor.runningOS.services.displayName | Display name for service on Guest OS |
| environmentFor.runningOS.services.name | Internal registration name for service on Guest OS |
| environmentFor.runningOS.services.pathName | Path name to service executable for service on Guest OS |
| environmentFor.runningOS.services.startMode | Start mode |

| Named field (without “vm.” qualifier) | Description |
|---|---|
| | for service on Guest OS |
| environmentFor.runningOS.services.type | Type of service for service on Guest OS |
| environmentFor.runningOS.systemType | Type of physical system provided by virtual machine to Guest OS |
| environmentFor.runningOS.versionInfo.buildNumber | Build number of Guest OS |
| environmentFor.runningOS.versionInfo.osVersion | Version of Guest OS |
| environmentFor.runningOS.versionInfo.servicePack | Service pack level of Guest OS |
| environmentFor.runningOS.versionInfo.servicePackMajor | Major version number of service pack level on Guest OS |

| Named field (without “vm.” qualifier) | Description |
|---|--|
| environmentFor.runningOS.versionInfo.servicePackMinor | Minor version number of service pack level on Guest OS |
| environmentFor.runningOS.versionInfo.version | Version of Guest OS |
| guestFamily | Family of Guest OS |
| guestFullName | Full name of Guest OS |
| guestId | ID for Guest OS type |
| hostname | Host name of virtual machine |
| hostserver.hostName | Name of ESX host for virtual machine |
| hostserver.ipAddress | IP address of ESX host for virtual machine |
| identity.apiVersion | Version of |

| Named field (without “vm.” qualifier) | Description |
|---------------------------------------|---|
| | hypervisor |
| identity.configFileName | Name of VM configuration file |
| identity.relativePathName | Path name of VM folder in storage location |
| identity.vmVendorName | Vendor of hypervisor |
| managedByServer | IP address of management server entity |
| managementServer.hostName | Name of VirtualCenter managing ESX host running virtual machine |
| managementServer.ipAddress | IP address of VirtualCenter managing ESX host running virtual |

| Named field (without “vm.” qualifier) | Description |
|---------------------------------------|---------------------------------------|
| | machine |
| manufacturer | Virtualization infrastructure vendor |
| memory | Memory configured in MBs |
| memoryOverhead | Memory overhead in bytes |
| model | Type of virtualization infrastructure |
| name | Name of virtual machine |
| networkAdapters.ipAddress.subnetMask | Subnet mask of NIC |
| snapshotSummary.dateCreated | Date when snapshot was created |
| snapshotSummary.description | Description of snapshot |
| snapshotSummary.filename | File name for |

| Named field (without “vm.” qualifier) | Description |
|---------------------------------------|---|
| | snapshot |
| snapshotSummary.fullPath | Full path of snapshot |
| snapshotSummary.name | Name of snapshot |
| snapshotSummary.powerStateWhenTaken | Power state of VM when snapshot was taken |
| snapshotSummary.quiesced | Quiescent state of VM when snapshot was taken |
| suspendInterval | Number of cumulative seconds suspended |
| toolsVersion | Version of VMtools running on virtual machine |
| virtualDisk.capacity | Capacity for virtual disk in KBs |

| Named field (without “vm.” qualifier) | Description |
|---------------------------------------|--|
| virtualDisk.controllerType | Controller type for virtual disk |
| virtualDisk.location | File system location of virtual disk |
| virtualDisk.location | Location of VMDK |
| virtualDisk.mode | Storage mode for virtual disk |
| virtualDisk.name | Name of virtual disk |
| virtualDisk.type | File system type of virtual disk |
| virtualMediaDevice.startConnected | Connection state of virtual media device when VM is powered on |
| virtualMediaDevice.connected | Connection state of virtual media device |

| Named field (without “vm.” qualifier) | Description |
|---------------------------------------|---|
| virtualMediaDevice.media | Media type of virtual media device |
| virtualMediaDevice.name | Name of virtual media device |
| virtualMediaDevice.type | Type of virtual media device |
| virtualNIC.adapterType | Type of NIC |
| virtualNIC.connected | Connection state of NIC |
| virtualNIC.macAddress | MAC address of NIC |
| virtualNIC.startConnected | Connection state of NIC when VM is powered on |
| virtualNIC.virtualNetworkName | Name of virtual network associated with NIC |
| worldId | World ID |

| Named field (without “vm.” qualifier) | Description |
|---------------------------------------|-------------|
| | number |

Using the query builder

The query builder is an interactive tool with which you can construct complex search queries without having to memorize attribute codes, or learning the subtleties of the core query language. To start the query builder, click **Advanced Search** on the search bar.

The query builder parses the text in the search bar. Each filter in the query text is rendered as an editable block.

In some cases, Virtualization Manager can enumerate all the legal filter values for your environment. Click the drop-down button next to the filter text to list all the values Virtualization Manager knows about.

In addition to matching a single fixed value, filters can match ranges. For example, “>512 MB” would specify all virtual machines which are configured for more than 512 megabytes of memory. Filters can also specify multiple requirements. “>512 MB <2 GB -1 GB” matches all virtual machines with more than 512 MB and less than 2 GB of memory, but excludes those with exactly 1 GB of memory.

Adding new filters

To add new filters, perform the following steps:

1. Click **Add Attribute Filter** or **Add Label Filter**.
2. Select the filter you want to add from the list.
3. Click **OK**.

With the **Add Attribute Filter** you can add a filter based on Virtualization Manager collected data. You can further filter these attributes based on the environment.

With the **Add Label Filter** you can add a filter based on the custom labels defined in Virtualization Manager. For more information, see [Custom labels](#).

By default, the query builder starts in form mode. Click **Editor Mode** to switch to edit mode, which shows the core query language, but still provides access to attribute search and sorting.

After designing the search query, click **Test** to run the query in test mode. The summary of the results is displayed in the right panel, but the contents of the search screen are not changed. Click **Run** to execute the query on the search screen. This action overwrites any current query.

Common use cases

You can construct complex queries to solve issues that would take great manual effort to resolve by collecting and tabulating data from various sources to reach conclusions that could only be acted upon with the use of external tools. This section contains examples of search queries that address specific administration issues and questions.

Operating system

| Issue | Search query |
|------------------------------------|--|
| Number of Windows X Machines | guestFullName:"Microsoft Windows Server 2003, Enterprise Edition (32-bit)" |
| Number of licensed VMs/Windows VMs | guestFamily:windowsGuest |

VI3 topology

| Issue | Search query |
|----------------------------|--|
| Number of VMs managed by X | managementServer/hostname:west-vc.hyper9.com |
| Number of VMs on host X | hostServer/hostname:california.hyper9.com |

| Issue | Search query |
|-------------------------------|---|
| Number of X of Y (Dell 2950s) | model:2950 AND "manufacturer: Dell, Inc." |
| All 3.0.x VMs | hostServer/deviceProperties/value:3.0.* |
| All 3.5.x VMs | hostServer/deviceProperties/value:3.5.* |

VM issues

| Issue | Search query |
|--|---|
| Number of VMs with tools version | toolsVersion:64607 |
| Show VMs with mis-matched tools | toolsVersion:64607 NOT hostServer-/deviceProperties/value:*Build-64607* |
| VMs that have been suspended | NOT suspendInterval:0 |
| Show VMs with less than 10 MB disk space | environmentFor/diskVolume/freeSpace:[0 TO 10000000] |
| VMs on virtual network X | virtualNIC/virtualNetworkName:Lake-Net |
| VMs with image files on X | virtualDisk/location:*Storage* |
| Number of Virtual Disk is 1 | \$/virtualMachine/virtualDisk/colSize:1 |
| Number of Disk Volumes is 1 | \$/virtualMachine/environmentFor/diskVolume/colSize:1 |

Vmotion

| Issue | Search query |
|-------------------------|--|
| VMs with media attached | NOT \$/virtualMachine/media/colSize:0 |
| VMs with media attached | virtualMediaDevice/connected:true |
| NICs down | NOT environmentFor/networkAdapters/status:Connected |

Cloning issues

| Issue | Search query |
|-----------------------------------|---|
| MAC address conflict on X | environmentFor/networkAdapters/macAddress:75:34:44:0b:48:19 AND NOT virtualNIC/macAddress:75:34:44:0b:48:19 |
| Time zone mismatch | NOT environmentFor/runningOS/currentTimeZone:-300 |
| VMs in time zone X | environmentFor/runningOS/currentTimeZone:-300 |
| Daylight Savings Time not enabled | environmentFor/runningOS/daylightInEffect:false |

Snapshots

| Issue | Search query |
|------------------------|---|
| VMs with snapshots | NOT \$/virtualMachine/snapshotSummary/colSize:0 |
| Non quiesced snapshots | snapshotSummary/quiesced:false |

Guest OS issues

| Issue | Search query |
|-------------------------------------|---|
| OS version is X.Y | environmentFor/runningOS/versionInfo/version:5.1.* |
| OS build is X | environmentFor/runningOS/versionInfo/buildNumber:2600 |
| GuestOS MAC different than vNIC MAC | environmentFor/networkAdapters/macAddress:75:34:44:0b:48:19 AND NOT virtualNIC/macAddress:75:34:44:0b:48:19 |

Services and applications

| Issue | Search query |
|--------------------------------|--|
| VMs with service running | environmentFor/runningOS/services/displayName:Alerter |
| VMs with application installed | environmentFor/runningOS/installedApplications/displayableName:VMware* |

Hotfixes and updates

| Issue | Search query |
|---------------------------------|--|
| Patches installed in the last X | environmentFor/runningOS/componentUpdates/installDate:[20080901 TO 20080930] |
| VMs with | environmentFor/runningOS/componentUpdates/displayName:KB* |

| Issue | Search query |
|-------------------------|--|
| Hotfix | |
| VMs with patch conflict | envir-onmentFor/runningOS/componentUpdates/displayName:KB111111 AND envir-onmentFor/runningOS/componentUpdates/displayName:KB222222 |

Chapter 8: Alerts

Virtualization Manager uses alerts to monitor the environment for specified conditions, and to notify users or external systems about those conditions. You can configure alerts to fire when a specific condition arises, when it ceases to exist, or both. Virtualization Manager contains over 40 alerts by default to help you identify and highlight common problems in virtual environments.

Note: Virtualization Manager includes an alert that triggers when a VM fails to send a heartbeat after the expected interval. For sending a heartbeat in a VMware environment, VMware Tools has to be installed, and in a Hyper-V environment the Integration Service has to be installed or enabled.

If no heartbeats are being received for any of the VMs on a host, it could indicate a problem on the host itself, or that none of the hosted VMs have the required VMware Tools or Hyper-V Integration Service installed or enabled.

To see the available alerts:

1. Click **Content** on the Explore tab.
2. Open the **By type** accordion on the left, and then select **Alerts**.

To create a new alert:

1. Search for a set of items that you want to alert on.
2. Click **Create Alert**.

To delete an alert:

1. Navigate to **Explore > Content**, and then filter or search for the alert you want to delete.
2. Select the alert, and then click **Delete** in the top right.

After performing these steps, the alert will be removed.



To disable an alert without removing it, navigate to **Explore > Content**, and then select an alert. Click **Open** at the lower left to open the Alert details page, and then click **Disable** in the lower right.

The alert creation screen contains the following tabs:

- [Scope](#)
- [Criteria](#)
- [Notifications](#)
- [Advanced settings](#)

Scope

At the highest level, the scope describes what data you analyze, and defines the importance of the alert. You can define the following details:

- **Severity:** The importance of the alert (informational, warning, or critical).
- **Item Type:** The type of content the alert will analyze (application, cluster, data store, host, or VM).
- **Search Query:** The search term that is used to retrieve the content the alert analyzes.
- **Evaluate on:** The frequency with which the data is to be analyzed.

Note: Every alert is analyzed as new data is collected by Virtualization Manager. If you set up an alert to evaluate on performance data, the evaluation happens every time new performance data are collected (10 minutes by default). If you set up an alert to evaluate on configuration data, the evaluation happens every time new configuration data are collected (12 hours by default).

Even though it may seem more granular to set up all alerts to evaluate on performance data collection, many alerts only consider configuration data in their evaluations, which does not change as frequently as performance data. Instead of

setting up every alert to evaluate on performance data, set the **Evaluate on** scope of the alert to match the data the alert analyzes.

Criteria

Alerts use criteria to evaluate data in the results of a search query, which is defined in the scope of the alert. The evaluation criteria includes the following:

- **Base Alert On:** The basis of the alert. This is either the [Search result count](#) or the [Attributes](#) within the search results.
- **Triggers on:** The rules based on which an alert is raised.

Search result count

Many alerts have most of the logic built into the query. This means that the alert only needs to be evaluated based on the set of results returned from the query. For these types of alerts, select **Search result count** in the **Base Alert On** section of the Criteria tab.

To specify that any results should fire the alarm:

1. In the **Triggers On** section of the Criteria tab, select **Any**.
2. Click **Save**.

To specify that the alert is fired when the number of search results is outside of a specified range:

1. In the **Triggers On** grouping of the Criteria tab, select **Range**.
2. Select the **Less Than** and **Greater Than** check boxes, and then define the range.
3. Click **Save**.

Because virtual environments are dynamic, you may only want an alert to fire if a condition for the alert has been met for a sustained period of time. For example, you may not want an alert to be fired immediately the first time when a single

search result is returned, but only if the search result is returned over a given time span. In this case, specify the time span in the **Sustained Minutes** field.

Note: Because alerts are only evaluated when new data enter the system, set the **Sustained Minutes** to a period that matches the collection period for that data type. By default, performance data is collected every 10 minutes, and configuration data is collected every 12 hours. Check the **Evaluate on** settings on the Scope tab to see whether the alert is evaluated on a performance collection schedule, or a configuration collection schedule.

Attributes

Some alerts are based on the attributes of the search results instead of the number of search results. This means that the alert must pluck properties from the search results and evaluate the value of that property.

To base an alert on the attributes of search results:

1. In the **Base Alert On** grouping of the Criteria tab, select **Attribute**.
2. Click **Find** to see the list of attributes available for evaluation.
Note: The list of available attributes is based on the type of object your search returns.
3. Select the unit of measure for the attribute you want to evaluate. Because Virtualization Manager allows XPath functions, it cannot automatically determine the correct unit.
4. Select an aggregation function to perform operations across the search results. The following options are available:
 - Average
 - Total
 - Count
5. Define the rules used in evaluation in the **Triggers On** grouping. Select one of the following options:

- Any: The alert fires if any attribute is returned.
- Range: The alert fires when the value of the attribute is outside of a specified range.

If you select **Range**, the following additional options are displayed:

- Select **Less Than** and **Greater Than** to define the range of values for which the alert should fire. The alert fires when the value is *in* the range, not *outside* of the range.
- Select **Evaluate this range once against the entire result** to base the alert on the total value across search results, as defined in the **Aggregation Function** list.
- Select **Evaluate this range against each VM** to base the alert on the attribute value of each search result.

Because virtual environments are dynamic, you may only want an alert to fire if a condition for the alert has been met for a sustained period of time. For example, you may not want an alert to be fired immediately the first time when a VM has high CPU utilization, but only if the high CPU utilization is sustained over a specific time span. In this case, specify the time span in the **Sustained Minutes** field.

Because alerts are only evaluated when new data is collected by Virtualization Manager, set the **Sustained Minutes** to a period that matches the collection period for that data type. By default, performance data is collected every 10 minutes, and configuration data is collected every 12 hours. Check the **Evaluate on** settings on the Scope tab to see whether the alert is evaluated on a performance collection schedule, or a configuration collection schedule.

Note: Alerts often perform mathematical operations on the properties. For such cases, you can use XPath in the **Attribute** field. In most cases, XPath is used to create an average or summary of multi-value properties. For example, to get the total free space of all disk volumes in a VM, type the following in the **Attribute**

field:

```
sum(/virtualMachine/diskVolume/freeSpace)
```

To get the cluster storage utilization, type the following in the **Attribute** field:

```
(sum(/cluster/datastore/freeSpace) div sum(/cluster/datastore/capacity))  
* 100
```

Notifications

Configure an alert to fire a notification when it is lowered or raised or is active. You can configure the way an alert sends notifications of status changes on the Notifications tab.

The status of every alert is evaluated automatically as new data is collected by Virtualization Manager. If you set up an alert to evaluate on performance data, the evaluation happens every time new performance data is collected (10 minutes by default). If you set up an alert to evaluate on configuration data, the evaluation happens every time new configuration data is collected (12 hours by default).

You can also evaluate an alert manually by saving your changes on the alert configuration page, or by clicking **Evaluate now** on the alert details page.

If you want to receive the notification every time the alert status is raised, lowered, or active, select **Notify on consecutive events**. Otherwise, select **Notify only when raised**. This way, Virtualization Manager only sends a notification when the alert is raised.

Each alert has the following four statuses:

- Inactive
- Raised
- Active
- Lowered

The following table describes when an email notification is sent with the different options selected.

| Selected options | Inactive | Raised | Active | Lowered |
|------------------------------|----------|------------|------------|------------|
| None | - | Email sent | - | Email sent |
| Notify on consecutive events | - | Email sent | Email sent | Email sent |
| Notify only when raised | - | Email sent | - | - |
| Both | - | Email sent | Email sent | - |

To receive an alert in email, specify the email address in the **Email To** field. You can enter multiple addresses separated by a comma.

Note: Virtualization Manager must be configured for SMTP before an alert can send email notifications when it is raised or lowered. For more information, see [Basic setup](#).

Using alert actions

When an alert fires, it can invoke an external action that can automatically fix a situation, or file a trouble ticket into a ticketing system. External actions are programs or command executions that are defined by an XML manifest file. To select an action to invoke when the alert fires, click **Pick an Action**. To disassociate an action currently associated with an alert, click **Remove the Action**.

Example Action

If you do not have any actions defined yet, the following sample manifest provides an example.

To use this example, perform the following steps:

1. Save the manifest file to the `data/content/externalActions` folder of your server.
2. Name it `logAlert.manifest`.
3. After the file is saved, click **Reload** on the Select an External Action window.

4. Select the action from the list.

```
<?xml version="1.0" encoding="UTF-8"?>
<manifest xmlns="http://www.hyper9.com/ws"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">

<enabled>true</enabled>

<type>ALERT</type>

<uniqueId>alert-test</uniqueId>
<name>Log Alert Summary</name>
<description>Logs a summary of this alert's firing details to a
file</description>

<command>perl</command>

<command>$MANIFEST_HOME/logAlert.pl</command>

<argumentPrefix>-</argumentPrefix>

<successCode>0</successCode>

<!-- Optionally specify the directory to start from -->
<!--<workingDirectory></workingDirectory>-->

</manifest>
```

For this example, a script was customized to run as the command, called `logAlert.pl`. There are two command elements. Use a new element for every time you have white space in your arguments.

Save the following code in the same `data/content/externalActions` folder as `logAlert.pl`. Because it is saved in the same folder as the manifest, the `$MANIFEST_HOME` variable from the previous manifest is used to describe its path.

```
#!/usr/bin/perl
# Author: Ryan Kruse
#
# Description: Designed to be called through the Hyper9 external actions
framework,
# this script simply uses the SOAP API to retrieve an Alert and log its
values to a file
#
use strict;
use Hyper9::Client;
use Getopt::Long;
```

```

my $timestamp;
my $alertId;
my $loginToken;

get_args();

my $client = Hyper9::Client->new( host => 'localhost:8983', );
#$client->{services_path} = '/single-vm';
$client->loginWithToken( username => 'admin', token => $loginToken, ) ||
die "Login failed\n\n";
my $alert = $client->getWorkspaceAsset(assetId=>$alertId);
$client->logout();

my $status = ($alert->{raised} eq 'true') ? "RAISED" : "LOWERED";
open( LOG, ">>logAlert.log" );
print LOG $timestamp."\t".$alert->{name}."\t".$status."\t".$alert->
{value}."\n";
close(LOG);

sub get_args
{
    my $help;
    GetOptions(
        "timestamp:i" => \$timestamp,
        "alertId:s"   => \$alertId,
        "loginToken:s" => \$loginToken,
        "help"        => \$help,
        "h"           => \$help,
    );
    usage() if ( $help || !($alertId) );
}

sub usage
{
    print STDERR << "EOF";

usage: $0 -timestamp=1271186678 -alertId=404cb4f0-4732-11df-9879-
0800200c9a66
-loginToken=62b796e0-4732-11df-9879-0800200c9a66

-timestamp : seconds since epoch
-alertId   : hyper9 ID of the alert
-loginToken : a token that can be used to login to the hyper9 web
service

EOF

    exit;
}

```

The following arguments are passed to all commands:

- **timestamp:** The time stamp of the alert firing instance. This can be used to retrieve more details of this alert firing.
- **alertId:** The ID of the alert. This can be used to retrieve more details of the alert.
- **loginToken:** A short-lived one time use token that can be used to log in to the Hyper9 web service.

The previous script uses the Perl Client (Hyper9::Client) module. You must download this module from the additional components page of the SolarWinds Customer Portal before you can run the action. Make sure it is installed in your Perl path. For more information, see [Using Perl SDK](#).

Consult the Web Services Description Language (WSDL) of your system (<http://your-server:8983/swvm/ws/hyper9.wsdl>) for information about all you can do through the SOAP web services.

SNMP settings

You can use external monitoring tools to view all system alerts, because Virtualization Manager can integrate with these systems by sending SNMP traps. SNMP traps are automatically sent for every alert if your system is configured for at least one trap receiver. For more information, see [Configuring SNMP](#).

If you do not want all alerts to use the same OIDs, specify a different OID per alert on the Advanced tab of the Alert definition. The SNMP alerts are always prefixed by the Virtualization Manager enterprise OID.

Advanced settings

On the Advanced tab of the alert creation screen you can define the following optional details about an alert:

- In Context Search Link
- In Context Performance Graph
- SNMP Trap OID Override

In the **In Context Search Link** grouping, you can define a search query which displays additional information about the resources for which the alert is raised.

For example, if you have an alert defined on the Scope tab which is raised when the VMs under a host do not send a heartbeat, you can additionally set up a query on the Advanced tab for displaying the list of VMs.

For information about displaying the results of the in context search query, see [Accessing historical alert information](#).

To define an in context search link:

1. Select the item type from the list for which you want to define the in context query.
2. In the **Search Query** field, set up the query by using one of the following methods:
 - Type the search query you want to use.
 - Alternatively, click **Query Attribute**, and then select the attribute you want to use as search query.
3. Type an informational description of the query. This information will be used as a tooltip.
4. Click **Choose Sort Field**, and then select the attribute by which you want to sort the results found by the search query.
5. Select whether you want to display the results in ascending or descending order.
6. Click **Save**.

In the In Context Performance Graph grouping, you can specify the performance graph you want to display in context with the resources the alert is raised for. Click **Choose Graph**, and then select a performance metric from the list. Click **Save** to persist your changes. For more information about displaying the performance graph in context, see [Accessing historical alert information](#).

In the **SNMP Trap OID Override** field, you can specify a different OID for an alert if you do not want all alerts to use the same OIDs. The SNMP alerts is always prefixed by the SolarWinds Virtualization Manager enterprise OID. Click **Save** to persist your changes.

Accessing historical alert information

You can access historical alert information in the **Explore** module by using the Time Travel tool of the Map, viewing the resource details, or by viewing alert details. Time Travel information is only available when a single item is in context.

Using the Time Travel tool

To use the Time Travel tool, perform the following steps:

1. Select a resource in the map.
2. Click **Context** to place it in context.
3. Click **View Calendar** to navigate.

Note: The icons of the items change color based on whether an alert was raised and on the severity of the alert. Hover over items to view which alerts were raised during the selected time period.

To see which resources have an alert raised, and which resources have had an alert raised in the past, view the history of an alert.

Viewing the history of an alert

To view the history of an alert, perform the following steps:

1. Go to **Explore > Content**, and then search for the alert.
2. Click the name of an alert, and then click **Open**.

The page displays basic information about the alert, such as its current state, and its alert criteria. If the alert is raised for one or more resources, the affected resources are also listed. By clicking the appropriate icons of a resource, you can perform the following additional actions:

- Click the Plus icon to add the resource to a list.
- Click the Map icon to place the resource in context on the map.
- If you defined an in context search query on the Advanced tab of the alert creation screen, click the Magnifier icon to view the results returned by that search query. If you specified a sort field on the Advanced tab of the alert creation screen as well, the results are displayed according to the defined sort field.
- If you specified an in context performance graph on the Advanced tab of the alert creation screen, click the Graph icon to view the performance graph for a resource.

Viewing alert information for a specific resource

To view alert information for a specific resource, perform the following steps:

1. Search for the resource.
2. Open the detailed view by clicking the name of the resource.
3. View the alert information under **Active Alerts**.

Note: You can also view the history of the alert here, by clicking the name of the alert.

Chapter 9: Capacity planning

Virtualization Manager includes a capacity planning module where you can see when your current virtual infrastructure will run out of resources, you can plan to add new VMs to your current infrastructure, and you can examine how new hardware will increase the capacity of your virtual infrastructure.

Note: Virtualization Manager uses only shared storage in capacity planning calculations.

Planning basics

Capacity planning is driven by a supply side and a demand side. The Capacity Planning module contains the following sections:

- The supply side is a Resource Container. A Resource Container defines the computing resources available in one or more hosts, or all the hosts in one or more clusters. In the capacity planning module, the Resource Container is in the upper left quadrant.
- The demand side is called a Usage Profile. A Usage Profile defines the set of VMs that use the computing resources. It is in the upper right quadrant.
- The bottom portion of the module displays the results from the capacity planning analysis.

For more information, see [Using resource containers](#) and [Using usage profiles](#).

Using resource containers

A resource container is a group of hosts that provide computing resources.

A resource container considers the following primary resources:

- CPU
- memory

- disk space

You can enter a resource container either directly from the Capacity Planning tab, or by running a search query.

To define a resource container through search:

1. Search for hosts in the **Search** field.
2. Select one or more of the results.
3. Click **Plan** to enter the Capacity Planning module. The resource container is in the upper left of the Capacity Planning module.

The resource container includes the following options:

- Click **Load** to load a resource container that you previously saved.
- Click **Edit** to modify, and then save the current resource container.
- Click **Pick Cluster** to define a resource container more generally, by specifying all hosts in a cluster.
- Click **All Clusters** to define a resource container more generally, by specifying all hosts in all clusters.

After clicking **Edit**, you can specify the members of a resource container in the following ways:

- By creating a static list of resources in the container.
- By creating a dynamic set of resources, by compiling a search query to search for either hosts or clusters. This query is executed in real time for all capacity planning operations. The benefit of this approach is that you can constantly update your capacity plan based on a dynamic query. The disadvantage is that the calculations only happen after the query is executed.

Note: If you choose to use a cluster, all hosts in that cluster are considered as resources.

This window provides the following options:

- Click **Show Profile** to toggle screens to edit the Usage Profile in context.
- Click **Load** to load a Resource Container that you saved previously.
- Click **Save** or **Save as** to save the resource container for future use. Resource containers are not saved by default.
- Click **Show Details** to get more details about the members of a resource container.

To get different views of the capacity plan, click the links at the bottom of the window:

- Click **Capacity** to open the utilization graphs that display the actual consumed capacity within the Resource Container.
- Click **Consumption** to view the dates when the resource will cross the configure warning and outage thresholds. For more information about configuring warning and outage thresholds, see [Advanced options](#).
- Click **Details** to view all the calculations that went into the capacity plan. For more information about capacity planning details, see [Showing the calculations and variables](#).
- Click **Scatterplot** to view the scatterplot graphs of IOPS.
- Click **Summary** to return to the Capacity Planning summary view which contains an overview of the resource container, the Usage Profile, and the Capacity Planning Results. If the calculation results are not displayed, click **Calculate** in the upper right of the Capacity Planning module.

Note: The total and average percentage values displayed in the resource container are the same by design. The VmAverage value can be lower if the load on the host or cluster includes non VM-related load.

Using usage profiles

A usage profile is a group of Virtual Machines (VMs) that consume computing resources. The following primary resource consumptions are considered:

- CPU
- memory
- disk space

To define a usage profile, you can enter the Capacity Planning module directly from the Capacity Planning tab, or by running a search query.

To define a usage profile through search:

1. Search for VMs in the **Search** field.
2. Select one or more of the results.
3. Click **Plan** to enter the Capacity Planning module. The usage profile is in the upper right of the Capacity Planning module.

Note: SolarWinds does not recommend creating usage profiles with more than 500 VMs. Usage profiles with more than 500 VMs negatively impact performance during capacity planning calculations.

The usage profile provides the following options:

- Click **Load** to load a usage profile that you previously saved.
- Click **Edit** to modify and save the current usage profile.
- Click **Cluster Average** to define a usage profile more generally, by specifying all VMs in a cluster.
- Click **All Clusters Avg** to define a usage profile more generally, by specifying all VMs in all clusters.

After clicking **Edit**, you can specify the members of a usage profile in the following ways:

- By creating a static list of VMs in the profile.
- By creating a dynamic set of VMs, by compiling a search query to search for either VMs or clusters. This query will be executed in real time for all capacity planning operations. The benefit of this approach is that you can constantly update your capacity plan based on a dynamic query. The disadvantage is that the calculations only happen after the query is executed. This means that the details of the average CPU, memory and usage utilization are not displayed in the **Edit** screen of the usage profile.

Note: If you choose to use a cluster, all VMs in that cluster are considered as members of the usage profile, and they are considered when calculating resource utilization.

The window provides the following options:

- Click **Show Container** to toggle screens to edit the resource container in context.
- Click **Load** to load a usage profile that you saved previously.
- Click **Save** or **Save as** to save the usage profile for future use. Usage profiles are not saved by default.
- Click **Show Details** to get more details about the members and the resource utilization of the usage profile members.

To get different views of the capacity plan, click the links at the bottom of the window:

- Click **Capacity** to open the utilization graphs that display the actual consumed capacity within the Usage Profile.
- Click **Consumption** to view the dates when the resources will cross the configured warning and outage thresholds. For more information about configuring warning and outage thresholds, see [Advanced options](#).

- Click **Details** to view all the calculations that went into the capacity plan. For more information about capacity planning details, see [Showing the calculations and variables](#).
- Click **Scatterplot** to view the scatterplot graphs of IOPS.
- Click **Summary** to return to the Capacity Planning summary view which contains an overview of the resource container, the usage profile, and the capacity planning results. If the calculation results are not displayed, click **Calculate** in the upper right of the Capacity Planning module.

Note: The total and average percentage values displayed in the resource container are the same by design. The VmAverage value can be lower if the load on the host or cluster includes non VM-related load.

When will I run out?

One of the most common questions around capacity planning is "When will I run out of resources." The answer depends on the deployment of new VMs and applications that consume resources. SolarWinds Virtualization Manager can predict when you will run out of resources based on how your environment has grown historically.

To answer this question, load a resource container in the Capacity Planning module. The resources within the specific container are considered when calculating when you will run out of resources.

The calculations examine the historical trending of the following values, and also project when one of these values will reach 100%:

- CPU utilization
- memory utilization
- disk space consumption and disk IOPs
- network consumption

Note: 100% is the default threshold, but you can customize this in the Capacity Manager. For more information, see [Advanced options](#).

To generate a graph of the historic performance of CPU, memory, and disk utilization, click **Consumption** at the bottom of the Capacity Planning module. The utilization graph shows the actual consumed capacity of the resources within the Resource Container.

The Consumption view consists of two parts:

- The large graphs show the historic values, and a best fit line.
- The table below the graph contains the calculated dates when each resource hits certain thresholds based on their current course and speed.

The table contains the following information for each resource:

- **Warn at:** The utilization percentage when a warning will be raised.
- **Warning Date:** The date when the metrics will reach the **Warn at** threshold.
- **Out at:** The utilization percentage when the resource is considered to be out.
- **Outage Date:** The date when the metrics will reach the **Out at** threshold.

Note: You can configure both the **Warn at** and **Out at** thresholds in the Capacity Manager. For more information, see [Advanced options](#).

To return to the Capacity Planning summary page, click **Summary** in the lower right.

How much more can I add?

Based on your current host resources, Virtualization Manager can analyze how many more virtual machines can be added to your virtual infrastructure. To perform this analysis, define a resource container with the hosts in consideration, and define a usage profile containing VMs that are representative of the new VMs you want to add.

To analyze how many more VMs you can add:

1. Load a resource container in the Capacity Planning module. The resources contained within the specific container are considered during the analysis.

The calculations examine the availability of the following resources on hosts within the resource container:

- CPU utilization
 - memory utilization
 - disk space consumption and disk IOPs
 - network consumption
2. Load a usage profile that contains VMs that are representative of the new VMs you want to add. The calculations examine the following consumption metrics of these VMs:
 - CPU
 - memory
 - disk space
 3. Click **Calculate** at the top right of the Capacity Planning module.

Note: The time the calculation takes is directly proportional to the number of members in the resource container and the usage profile. Depending on the number of members, the calculation can take a few minutes.

The Capacity Planning Results table displays the number of VMs you can add to the hosts within the resource container. The binding resource which prevents more VMs from being added is also displayed next to the number of VMs in parentheses. The table contains one row for every cluster with hosts included in the resource container, and displays the following information for each cluster:

- **Workload (constraint):** If you specified the number of VMs you want to add and their specifications in the **Workload** section of the Advanced Options, this column displays how many times you can add all of them. For more information, see [Advanced options](#).
- **Small VMs:** This column displays the number of VMs you can add if you only add the smallest VMs within the usage profile, which consume the least resources.

- **Average VMs:** This column displays the number of VMs you can add, based on the average resources consumed by VMs within the usage profile.
- **Large VMs:** This column displays the number of VMs you can add if you only add the largest VMs within the usage profile, which consume the most resources.

For a more visual representation of the number of VMs you can add, click **Capacity** in the bottom of the Capacity Planning module.

The bar chart on the left shows all the clusters or hosts. If the resource container you used for the calculations holds clusters, the chart shows clusters. If the resource container holds hosts, the chart shows hosts. Each of the consumed resources is represented per cluster or host. The chart provides an overview of the latest resource utilization information across the given resource container.

The **Remaining Capacity** bars of the bar charts on the right show the number of VMs that may be added. The charts display the following information:

- VM capacity by CPU
- VM capacity by memory consumption
- VM capacity by disk space consumption
- VM capacity by storage I/O consumption
- VM capacity by network I/O consumption

Note: The charts take into account the settings you specify in Advanced Options, and are refreshed whenever you click **Update** in the Advanced Options section, or click **Calculate** at the top right of the Capacity Planning module. For more information, see [Advanced options](#).

Calculating VM sizes

Virtualization Manager calculates the sizes of small, average, and large VMs based on the information contained in the usage profile.

If the Usage Profile does not include clusters, the sizes are calculated based on all the averaged values per resource included in the usage profile. You can view these values in the **Details** view of the usage profile.

Small: The minimum value of all the averaged values of the resources.

Average: The average of all the averaged values of the resources.

Large: The maximum value of all the averaged values of the resources.

If the Usage Profile contains clusters, the calculation uses minimum, maximum, and average values from cluster trends.

What if I add more resources?

For the [When will I run out?](#) and [How much more can I add?](#) use cases, you may want to plan while considering new host resources that are not currently part of your virtual environment. To accomplish this, click **Advanced options** in the bottom left of the Capacity Planning module. For more information, see [Advanced options](#).

To simulate adding more hosts:

1. Open **Calculation Settings** within the Capacity Manager.
2. Specify the following information:
 - The number of hosts to add
 - The number of CPUs per host
 - The speed of each CPU (in MHz, not in GHz)
 - The memory per host (in GB)
 - The shared disk space per host (in GB)
 - The IOPS measurement of the disk
 - The Net I/O (Mbps)
3. Click **Update** to see how the new resources affect the number of VMs you can add.

Note: These options are saved in the resource container. To save your specifications, make sure that you save the resource container. The total extra resources that will be added to this resource container are the resources per host multiplied by the number of hosts. Any calculations outlined in the [When will I run out?](#) and [How much more can I add?](#) use cases consider these new resources as available when using this resource container.

Overloaded hosts

In general, the best indicator of an overloaded datastore is the latency, or response time, of read/write requests to the datastore. Outside of the storage dashboard and alerts, you can determine when datastores will be overloaded based on the current performance.

After adding your datastores to the chart, select a device latency graph or line to see which datastores are experiencing the highest response time. You can also plot IOPs for the datastore and the corresponding VMs to find the VMs that generate the most IO.

Advanced options

On every screen within the Capacity Planning Module, the **Advanced options** link is at the bottom left of the screen. Click this link to customize how the capacity plan is calculated.

The advanced options column is displayed on the left of any capacity planning screen. The options are separated into the following four sections in an accordion control:

- [Calculation settings](#)
- [Resource types](#)
- [Workload](#)
- [Sample period](#)

Calculation settings

Any time you click **Calculate**, Virtualization Manager analyzes the load on the resource container, calculates the remaining capacity, and then determines how the usage profile would fit into the remaining capacity. You can modify the way capacity is calculated in the Calculation Settings.

This section contains the following fields:

- **Mem Wastage:** Spare memory due to non-uniform VM resource requirements.
- **Mem Oversub:** Amount of memory over-subscription as configured in the VMWare Virtual Center.
- **Sizing Target:** Defines how the CPU, memory, and disk space utilization values are used in calculations.
 - **Peak:** Default setting which looks at the peak resource utilization.
 - **95th Percentile:** Ignores the peak, and calculates based on the 95th percentile of resource utilization.
 - **75th Percentile:** Ignores the peaks and high spots, and calculates based on the 75th percentile of resource utilization.
- **Reserved/Additional hosts**
 - **Failover Capacity**
 - **Number to add:** Performs calculations assuming more host resources than currently used in the virtual environment. For more details, see the [What if I add more resources?](#) use case.
 - **CPU (count):** The number of CPUs per host.
 - **x Speed (MHz):** The speed of each CPU (in MHz, *not* GHz).
 - **Memory (GB):** Memory per host (in GB).
 - **Shared Disk (GB):** Shared disk space per host (in GB).

- **Disk I/O (IOPS):** The IOPS measurement of the disk.
- **Net I/O (Mbps)**

To make the new settings take effect immediately, click **Update** at the bottom of the custom Calculation Settings.

Resource types

When viewing the resource consumption chart as described in the [When will I run out?](#) use case, the thresholds for a warning and an outage are configurable in the Resource Types section of the Capacity Manager.

To make the new settings take effect immediately, click **Update** at the bottom of the custom Resource Types.

Workload

In the **Workload** section you can define a theoretical set of new VMs to deploy in your environment to see if your current resources can support it. This is part of the [How much more can I add?](#) use case.

To make the new settings take effect immediately, click **Update** at the bottom of the custom Workload.

Sample period

In the **Sample Period** section you can specify the performance data used to calculate load on a resource container. The default is to use your average performance data for all day over the last 30 days, but you can change the default settings to use only data collected during business hours, or only during daylight hours.

To use only samples pertaining to certain time periods:

1. Click the radio button next to **Start**.
2. Specify the daily interval when you want to collect performance data.

3. Specify the days of the week when you want to collect performance data.
4. Click **Update** to save your changes.

Note: The settings you specify are saved within the resource container.

Showing the calculations and variables

From the Summary page of the Capacity Planning module, you can also reach all the calculations that go into a capacity plan.

To view the calculations:

1. Open the Capacity Planning module.
2. Click **Details** in the bottom right.

The Details page displays the calculations which were performed in the order they were performed.

To view the calculation data in a spreadsheet or a text editor, click **Copy** in the upper left of the Details page.



Chapter 10: Configuration comparison

Virtualization Manager can retain historical data for performance, state, event, and configuration data, and can visualize this data in a manner that helps you understand the life cycle of virtual machines and hosts. Select one or two virtual machines or hosts from a search query result list on the search results page, and then click **Compare** for further historical analysis.

Using DNA comparison

DNA™ Comparison consists of two parts that together comprise the unique attributes of a virtual machine or host throughout its life cycle.

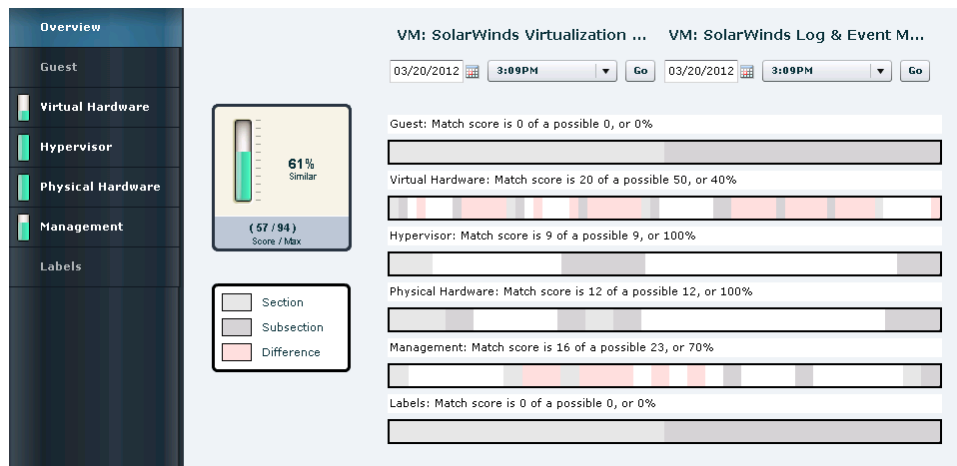
The first part is the identity attributes. These make up the combination of unchanging attributes that define what uniquely identifies a virtual machine or a host through typical life cycle transitions.

The second component of DNA™ Comparison comprises all the remaining attributes of virtual machines or hosts that are subject to change and that uniquely identify it at a particular point in its life cycle. This second class of attributes is available for historical analysis by the Compare feature.

The first step to performing comparisons is to find the VMs or hosts. Select the objects you want on the search results page, and then click **Compare**.

The following screen is displayed to compare the two objects. This is an overview of the comparison of every attribute collected for the objects at the time of the most recent data collection interval.

Chapter 10: Configuration comparison



This page is comprised of several key details. The left column displays a list of categories of attributes that you can examine for comparison on a category by category basis. The degree of differences for each category is also displayed in a gauge to the left of the category name. The green represents similarities and the white space represents differences. The overall matching percentage based score is computed and presented by the gauge on the results pane with a comparison of the direct attribute counts below. The meaning of the colors is similar to the attribute categories.

The majority of the results page is dedicated to the comparison of the selected objects.

Comparing an object to itself

To compare an object to itself over time, change the time selectors to the times you want, and then click **Go**. This way you can compare a virtual machine or host to itself over time to understand configuration drift of the object and to pinpoint configuration changes across a specific data collection interval and therefore a specific time frame.

Comparing two objects

If you select two objects from the search results, the comparison between the two objects occurs at the last point when data was collected for each one individually.

Multiple virtual machine or host comparisons help you understand changes that should have some degree of logical similarity such as parent-child relationships in cases of VM cloning, or similarly configured VMs such as cluster members.

The Comparison overview screen also presents a graph of the degree of difference between each of the different categories of attributes to quickly identify attribute categories of interest. Each color on the bars for each category represents a different comparison state. White represents attributes that are identical between objects selected, and pink represents attributes that have different values. Each bar also has metrics for the percentage of similar attributes and raw attribute similarity comparisons. The gray areas are section headers.

Using detailed comparison by category

To examine a particular attribute category in more detail, select the category for a detailed analysis of every attribute in the category. The resulting display lists the attribute name in the left column and the resulting values for each object in the remaining columns. The color-coding represents a different comparison state.

White represents attributes that are identical between the selected objects, and pink represents attributes that have different values. The scroll bar to the right of the table gives an at a glance view of the differences so that you can immediately scroll to particular areas. The radio buttons to **Show all fields** or **Only show differences** refresh the table to show all attributes or only the attributes that are different in value or their presence.

Chapter 11: Dependency maps

By using dependency maps, you can see one item in your virtual infrastructure and its relationship to the rest of the infrastructure. Dependency maps provide a way to see how problems in your environment may affect applications, services, or other areas of your virtual infrastructure.

Dependency maps start with one or more items in context. Initially, the items in context appear in the top box. All items that depend on (or are depended on by) the items in context then appear in the other four boxes. There are generally a total of five boxes in a dependency map.

- Virtual Machines
- Hosts
- Clusters
- Datastores
- Applications

The items displayed in their boxes are *only* the items that are related to whatever is in context. Changing the context will change the dependencies.

Using the initial context

To see the dependency maps, perform one of the following steps:

- Click **Explore**, and then click **Map**. This method opens the dependency map with all clusters in context. By definition, this means that the dependency map shows the entire virtual environment.
- Select one or more items from search results or the active list, and then click **Map** in the action bar. This method places the selected items in context.

Only those virtual infrastructure items that are related to what is in context will be displayed on the dependency map.

Setting context

To reset the context, click **Show Entire Environment** on the left. This puts all clusters in your virtual environment in context. By definition, this means that each box contains all entities: VMs, hosts, datastores, and applications.

To set the context to just a few items currently in the map:

1. Select the small check box in the upper left corner of the items you want.
2. Click **Context** in the main box to put the selected items in context.

Understanding alerts

In all boxes, any entity that has an alert firing displays a colored icon. Hover over the item to get details of the alerts that are currently firing.

The colors and their meanings are the following:

| Color | Meaning |
|----------|---------------|
| No color | No alerts |
| Blue | Informational |
| Yellow | Warning |
| Red | Critical |

This legend is displayed in the top right of the dependency map. Clear the relevant check boxes to fade alerts into the background if you do not want to see them.

Adding items to a chart

To add items to a chart, perform the following steps:

1. Select the small check box in the upper left of the items you want to add to a chart.
2. Click **More** in the upper right, and then select **Add to Chart**.
3. Select the chart to which you want to add the item.

Exporting data

To export data, perform the following steps:

1. Select the small check box in the upper left of the items you want to export.
2. Click **More** in the upper right, and then select **Export**.
3. Add any attributes you want to include in the data export, or load a predefined template.
4. Click **Run Export**.

Adding items to a list

To add items to a list, perform the following steps:

1. Select the small check box in the upper left of the items you want to add to the list.
2. Click **More** in the upper right, and then select **Add to List**.

Sorting items

To sort a box, place an item in context first. Click **Sort by** in the lower left of the box, and then select how to sort the items in the box. Click **OK** to finalize the sort.

Using Time Travel

To view the dependencies of a specific time and date, ensure that a single item is in context. The Time Travel control switches to “ON” when a single item is in context. Click **View Calendar** to browse to the date you want. The map changes

accordingly, providing a historical view of the configuration and dependencies of your virtual infrastructure.

Any Comparison or Add to Chart commands you run on objects while in Time Travel mode run in the context of the selected time period.

Note: The Time Travel control is only available if there is a single object in the context box.

Chapter 12: Content

The Content module of Virtualization Manager has two main sections. The left side is a content filter where you can drill down to exactly the type of content you want based on its attributes. You can filter the content in the viewer by Tags, Type, or User (Owner) and Permissions.

The right side of the content viewer displays the content itself based on the filters that you have applied. You can sort any list of content, using the **Sort by** list on the top right of the content viewer. You can sort content by name, type, creation date, or modification date.

Editing content

After you have found the content you want, click it to get the details and actions you can take with that piece of content.

The actions at the bottom of the screen are the following:

- **Edit (pencil icon):** Allows you to change the name, description, or permissions of the content.
- **Configure:** Launches the editor to change the content based on its type.
- **View:** Launches the viewer to see the output of the content based on its type.

Note: Not all types of content have the same operations available to them.

Adding and removing content

Content is not static in Virtualization Manager, it can be added and removed. To remove content, select it, and then click **Delete**.

Any time you create and save content of any type in Virtualization Manager, it is displayed in the content manager with you as its owner. This is the most common way that content is created.

SolarWinds may release periodic content updates and these new pieces of content can be imported into your system.

Importing content

To import content, perform the following steps:

1. Click **Import Content** in the lower right of the content viewer.
2. Select the file to import.
3. Select the privileges (visibility) that you want to assign the new content. Virtualization Manager content is in XML format and you can browse to open any XML file that SolarWinds delivered to you to import it into the system. After import, the new content is available in the content browser and can be edited, executed, deleted, or tagged.

You can also export content to share with other Virtualization Manager users, or to request assistance from SolarWinds Technical Support.

Exporting content

To export content, perform the following steps:

1. Select the content in the Content viewer.
2. Click **Export** in the upper right.
3. Click **Save** on the window that appears to name the export file and select its location.

Content types

The following table lists the content types with a brief description.

| Content type | Description |
|---------------------|---|
| Alerts | Monitors incoming data and triggers notifications based on rules. |
| Dashboards | Collections of widgets available on the user's home page. |
| Lists | Collections of configuration items (CIs), such as VMs, hosts, datastores, clusters, and applications. |
| Queries | Search terms to find configuration items. |
| Reports | MS Excel or PDF output from canned reports or data export. |
| Resource Containers | Used by the capacity planning module to define the supply of resources. |
| Usage Profiles | Used by the capacity planning module to define the usage of resources. |
| Templates | Used by data export to define what properties of a configuration item to export. |
| Trends | Periodic searches and functions to track changes in a virtual environment over time. |

Each piece of content has the following attributes:

- Tags
- Type
- Owner
- Permissions

Tags

In the Tags accordion content filter section on the left, you can filter content by tags. By default, this view has no tags selected, so it shows all content regardless of tags. Select one or more tags to filter the view to only show content with the specific tag. This way you can filter content to only see pieces that can help with a problem at hand. For instance, if you have storage issues, select the Storage tag on the left to see all content where you can search, trend, or alert on storage related issues.

Modifying the tags of a piece of content

To modify tags, perform the following steps:

1. Select the content, and then click **Tags**.
2. With the **Assign** button selected, click each tag you want to add to the content.

Removing tags from a piece of content

To remove tags, perform the following steps:

1. Select the content, and then click **Tags**.
2. Click **Remove**, and then select the tag names to remove.

Creating custom tags

To create custom tags, perform the following steps:

1. Click **Tags** in the top right of the content viewer.
2. Click **Assign**.
3. In the text box next to the **Plus (+)** button, type the name of the new tag.
4. Click the **Plus (+)** button.

After clicking the **Plus (+)** button, the new tag can be applied to all content.

Owner and permissions

For administrators, all content is accessible on the content management page. Non-administrator users only have access to their content and the publicly readable or writable content of other users.

You can change the permissions on any content that you own or that is world writable.

To modify permissions:

1. Select the content, and then click the **Pencil** button in the bottom left.
2. Select the permission type you want from the **Permission** list.
3. Click **Save**.

To change the owner of a piece of content, you must own the content, or the content must be world writable.

To change the owner of a piece of content:

1. Select the content, and then click **Set Owner**.
2. Select the user you want to make the owner of the content.



Chapter 13: Lists

Lists, and more specifically, the Active List, provide a mechanism to group related objects into permanent collections to be reused at any time. Lists can contain VMs, hosts, clusters, datastores, and applications.

For example, if you search for a specific set of VMs requiring a patch, you can add the results of the search to the Active List and save that list for future reference. This way you can use the list as a holding pen of VMs requiring the patch update. As VMs get patched, they can be removed from the list.

Another example is grouping a collection of hosts based on ownership, role, geography, or any combination of attributes for the purpose of sharing these lists with other Virtualization Manager users. You can make the lists private, publicly readable, or publicly writable.

Lists are different from search queries in that they are static by nature. If a VM changes characteristics that are criteria for a search query, that VM does not show up in the result set anymore, but it remains in the list.

Note: The only exceptions are cases where the VM is unregistered with a vCenter server or otherwise made unavailable for data collection.

Nearly every screen and module in Virtualization Manager has buttons or links to add items to the active list. These are usually an orange "+" icon or button next to virtual objects (VMs, hosts, and so on). Click the orange "+" to add a single object to the active list. When there are multiple objects on a page like on search results pages, or on dependency maps, you can select multiple items. Click **Add to List** to add all these items to the active list. Likewise, some types of dashboard widgets have an **Add to List** button, usually located at the top of the screen or control, to add their contents to the active list.

Note: At any given time, there is only one active list. It is displayed in the Explore tab under **List**.

You can continuously add items to the active list from multiple pages in Virtualization Manager. After you have completed finding and adding VM objects to the active list, you can review the items in the active list at any time by selecting the Explore module tab and clicking **List**. This brings up the current contents of the active list.

This page works much like the search page in that each item and each group of items has check boxes next to it. Selecting one or more items brings up a row of action buttons to do things such as comparisons, data exports, adding notes, and so on.

You can perform several different operations with the items on the list:

- Remove items from the list
- Add a note to items
- Add items to chart
- View items on the Map
- View the notes pertaining to items
- Export items
- Plan and manage capacity
- Add labels to items
- Compare items
- Add items to app

The actions you can perform with the whole list are the following:

- Click **Save as** in the bottom right to save the contents of the current list for later use. Specify the permissions, name, description, and one or more tags when saving a new list.
- Click **Clear** to remove the contents of the entire active list.
- Click **Load** to load a list you saved previously.



Chapter 14: Reporting

There are two types of reporting possibilities in SolarWinds Virtualization Manager, [On-demand reporting](#) and [Data exports](#).

Reports can be configured to run on a periodic basis according to a schedule and are known as [Scheduled report jobs](#).

Data exports

You can export the results of any search query or list to a Microsoft Excel spreadsheet in XLS format. When it is exported, you can download the results immediately or save them as a report for sharing with other Virtualization Manager users. This is particularly useful when you want to share the results of a query, condition, or state of your virtual infrastructure with others. You can either provide the export results in Microsoft Excel (XLS) format for emailing to others who do not have access to Virtualization Manager such as managers, suppliers, or vendors, or place the report in a shared folder within Virtualization Manager for other users to see.

Generating exports

To generate an export, perform the following steps:

1. Select one or more items in the search results page, or in the active list.
2. Click **Export**.
3. In the left column of the Data Export screen, verify that you have selected the appropriate objects to export data from. If you have not selected the objects you wanted, click either **Load list** or **Load search** to reset the **Export These Items** list.
4. Click **Add Attribute** in the right column.

5. Select the attributes you want to export, either from the list, or by using the **Filter** field.
6. Click **OK**.
7. Repeat **Steps 4 to 6** for every attribute that you want to export.
8. Click **Run Export**.

As the report runs, it is displayed in the report schedules page. When it is completed, you can download the resulting report immediately, or you can refer to it at any point as a piece of content.

Generating exports from a search query

To generate exports from a search query, perform the following steps:

1. Type a search query in the search field.
2. After the query is executed, click **Export Results**.
3. Follow **Steps 3 to 8** of the previous export procedure.

You can save the attributes you selected as a standard named set by clicking **Save as** at the bottom right of the data export screen. Similarly, you can load a saved set of attributes by clicking **Load** at the bottom right of the data export screen.

Virtualization Manager contains several templates for all types of objects. Click **Load Template** in the right column of a fresh Data Export page, or click **Load** at the bottom right of the data export screen.

On-demand reporting

On-demand reports provide a mechanism for exporting data from Virtualization Manager. Scripted reports differ from data exports by adding additional data or doing additional processing. While data exports enable you to create a spreadsheet of data that has already been collected, a scripted report can collect additional data from external sources and process it to present new insight.

To access the reporting interface:

1. Click Reporting.
2. Click **On-Demand Reporting**.

The following scripted reports are available in SolarWinds Virtualization Manager:

- Active Snapshots
- Chargeback
- Connected Media
- Orphaned Files
- Oversized VMs for a specific Cluster
- Undersized VMs
- Unused Templates
- VM Aging
- VM Free Space

To execute any of the reports, select it either directly from the reports lists, or from the report categories listed on the right. Reports are generated from direct connections with live data sources. Therefore a Virtual Center or Hyper-V server instance must be specified in the selection list. The format for the report data is a Microsoft Excel 2007 spreadsheet (XLS) file.

Besides the scripted reports, you can create your own reports as well. For more information about creating reports, see [Using custom reports](#).

Scheduled report jobs

After executing a report, you are redirected to the Report Schedules page. A "job" is a generic word for any scheduled task. Scheduled reports are the most common type of scheduled jobs. This page shows you the status of the job or jobs

in progress, and here you can also configure the jobs to run them on a periodic basis.

The Report Schedules page has the following columns:

- Scheduled
- Running
- Completed

When a job is being executed, it is displayed in the **Running** column. Usually, a report that runs only once only stays in the Running column for a few seconds or minutes. When it has finished running, it is moved to the **Completed** column. The items marked in green in the **Completed** column ran successfully. Items marked in red failed during execution.

Downloading reports

After a scheduled job is executed, it is displayed in the Completed column, and the resulting report is available for download.

To download a report:

1. Click **Download**.
2. Click **Save**, and then specify the location where you want to save the report.

Configuring schedules

Click **Configure** to configure a schedule. The job configuration dialog has the following tabs:

- **Information:** Here you can view and change the name and description of the job. For reports, this is the name and description of the resulting report when it completes and is present in your content.
- **Schedule:** Here you can configure a repeating schedule for a job. In practice, this is most commonly used to generate daily, weekly, or monthly reports. Select the start time and the recurrence interval (Once, Daily, Weekly, Monthly, or Cron). If you select Cron, fill in the Cron expression in

GMT to describe the recurrence interval. Finally, you can choose an end date after which no more jobs will be run on this schedule.

- **Notifications:** Here you can specify the users you want to notify of the completion of a job. You can enter multiple email addresses, separated by a comma. If the job is a report, the users on the notification list receive an email stating that the report completed, and the report itself is also attached to the email.

Note: You must enable an SMTP server under **Setup > Administration > SMTP Configuration** to be able to send emails.

Removing report jobs

To remove a scheduled job and prevent it from being executed again, select the job in the **Scheduled** column, and then click **Remove**.

Note: You will not be asked for confirmation before the job is deleted.

Pausing and resuming report jobs

Pausing a scheduled job prevents it from being executed while it is in a paused state. To pause a job, select the job in the **Scheduled** column, and then click **Pause**.

To make the job active again, click **Resume**.

Using custom reports

The easiest way to create a custom report is to base it on a saved query. For example, to report the number of VMs with more than four snapshots, perform the following steps:

1. Type `vm.snapshotSummaryCount:[4 TO *]` in the search bar, or use the Advanced Search feature.
2. After the query runs, save the query, and then navigate to **Reporting > All Reports > Queries**.
3. Select the query from the list, and then click **Create Excel Report**.

4. Specify the permission, name, description, and the associated tags of the new report.
5. Click **Save**.
6. To schedule when the report runs and who is notified when it has run, go to **Reporting > Report Schedules**.

You can also create custom reports by using dashboard reports.

To run a dashboard report:

1. Create a custom dashboard.
2. Click **Create Dashboard Report** in the top right of the dashboard.
3. Specify the permission, name, description, and the associated tags of the new report.
4. Click **Save**.
5. To configure when the report runs and who is notified when it has run, go to **Reporting > Report Schedules**.

Notes:

- Dashboard reports are published as PDFs.
- Some widgets on the dashboard are not printed in the report, such as maps or RSS feeds.

Chapter 15: Custom labels

Labels provide a mechanism to insert business information into Virtualization Manager so that business data can be searched, exported, and compared. Labels are similar to custom fields in Virtual Center. You can define both the name of the label and assign a different value to one or more hosts or VMs. The new label becomes a part of the host or VM data so that it can be used throughout SolarWinds Virtualization Manager.

The most common uses for labels are to assign VMs and hosts to departments, lines of business, applications, or resource pools. You can then create searches based on those values. Because you can search on the data, you can also use those searches as the basis for trends. You can use this mechanism for charge-back. In addition, all custom fields are available as facets that you can view in the Facet Explorer or in the search results.

Creating labels

To create a label, perform the following steps:

1. Select one or more result on the search results page.
2. Click **Label**, and then click **Add new field**.
3. Specify the name of the label, and then click **Create**.

The Labels page also shows all of the currently defined labels and the values of those labels on the selected search results.

Modifying labels

To modify a label, perform the following steps:

1. Type the new value in the field next to the appropriate label.
2. Click **Save changes**.

Removing labels

To remove a label, perform the following steps:

1. Select the label from the list.
2. Click **Delete a field**.

Note: If you remove a label, no history of the label or its value will remain.

To search for a label, type the value of the label into the Search Query.

Alternatively, you can also type the label name and value separated by a colon.

For instance, if you have a label named "Department" and you want to find entities in the "Finance" department, you can search for either:

`Finance`

or

`Department:Finance`

Chapter 16: Notes

Notes are a mechanism to document details of VMs, hosts, clusters, datastores, and applications that cannot adequately be documented through other means. By annotating a virtual object, you can create a journal of running commentary on the life cycle of items in the virtual infrastructure. This is useful as it can be made to capture the reason why something changed, as opposed to the what, when, and how of changes. This sort of information is typically not provided in event logs or other sources of management data.

Adding notes

To add a note, perform the following steps:

1. Select one or more objects on the search results page, the active list, or configuration item view.
2. Click **Add Note**.
3. Specify the content, the permission, the tags and the expiry date of the note.
4. Click **Save**.

Viewing notes

To view existing notes, perform the following steps:

1. Select one or more objects on the search results page or the active list.
2. Click **View Notes**.

The results provide details about each note, when it was created, who created it, and for which entity it applies. In addition, you can get a link to any of these notes as well as provide any additional commentary on the existing notes.



Chapter 17: Using the SolarWinds Integrated Virtual Infrastructure Monitor

The following sections provide more information about the features available in the Orion Web Console.

The section contains the following topics:

- [Account limitations](#)
- [Virtualization thresholds](#)
- [Using baselining](#)
- [Understanding Object Statuses](#)
- [Creating virtualization alerts in the Orion Alert Manager](#)
- [Creating virtualization reports in the Orion Report Manager](#)
- [Viewing related entities in the Orion web console](#)
- [Viewing storage infrastructure information in the Orion web console](#)
- [Monitoring hardware health in IVIM](#)

Account limitations

Account limitations can be used to restrict user access to designated virtual machines, hosts, clusters, or data stores, or to withhold certain types of information from designated users.

The following account limitation types are available for use in the integrated Virtualization Manager resources:

- Single Virtual Machine
- Group of Virtual Machines
- Virtual Machine Name Pattern
- Single Virtual Host
- Group of Virtual Hosts
- Virtual Host Name Pattern
- Single Cluster
- Group of Clusters
- Cluster Name Pattern
- Single Datacenter
- Group of Datacenters
- Datacenter Name Pattern
- Single Virtual Center
- Group of Virtual Centers
- Single Datastore
- Group of Datastores
- Datastore Name Pattern

Setting up user account limitations

To set up user account limitations, perform the following steps:

1. Log in to the Orion Web Console as an administrator.
2. Click **Settings** in the top right of the web console, and then click **Manage Accounts** in the **User Accounts** grouping of the Orion Website Administration page.

3. To limit an individual user account, complete the following steps:
 - a. On the Individual Accounts tab, select the account you want to limit.
 - b. Click **Edit**.
 - c. In the **Account Limitations** section, click **Add Limitation**.
 - d. Select the type of limitation you want to apply, and then click **Continue**.
 - e. Define the limitation as directed on the Configure Limitation page that follows.
 - f. Click **Submit**.
4. To limit a group account, complete the following steps:
 - a. On the Groups tab, select the group account you want to limit.
 - b. Click **Edit**.
 - c. Click **Add Limitation** in the Account Limitations section.
 - d. Select the type of limitation you want to apply, and then click **Continue**.
 - e. Define the limitation as directed on the Configure Limitation page that follows.
 - f. Click **Submit**.

Note: Limitations applied to a selected group account only apply to the group account, and not, by extension, to the accounts of members of the group.

Virtualization thresholds

The Virtualization Thresholds settings page lets you configure warning and critical (high) thresholds for statistics collected for VMware objects.

Objects with measurements that exceed the Warning Level threshold are displayed in red text.

Objects that exceed the High Level threshold are displayed in red text with bold type.

Using baselining

Using the baselining feature, you can display baselines on different charts in the Orion Web Console. In the Orion Web Console, you can define general static thresholds for every entity, and you can base alerts on the global static thresholds. However, you can also override the global threshold, and specify a custom dynamic baseline threshold on an entity per entity basis.

The baseline is calculated based on the normal historical distribution of data, taking the mean and standard deviations into account. Baselines can be used to detect and alert on deviations from the average values. Baselines can be calculated automatically, and can be applied as soon as sufficient statistical data becomes available. You can also recalculate baselines on demand.

Note: Some of the values that are considered during baseline calculation come from Virtualization Manager. For this reason, baselining only works when Virtual Integration Manager (VIM) is enabled.

The following table contains the list of statistics for which baselines are applicable.

| vNode | Statistics |
|----------------------------|--|
| VIM clusters (VMware only) | <ul style="list-style-type: none">• CPULoad• MemLoad |
| VIM hosts | <ul style="list-style-type: none">• NetworkUtilization• MemLoad*• CPULoad* |

| vNode | Statistics |
|----------------------|---|
| VIM virtual machines | <ul style="list-style-type: none">• CPULoad• MemLoad• CPUReady*• IOPSTotal*• IOPSRead*• IOPSWrite*• LatencyTotal*• LatencyRead*• LatencyWrite*• Network Usage Rate |
| VIM datastores | <ul style="list-style-type: none">• IOPSTotal*• IOPSRead*• IOPSWrite*• LatencyTotal*• LatencyRead*• LatencyWrite* |

* - For the statistics marked with asterisk, baselines are only available if Virtualization Integration is enabled, and the vNodes contain data sent from Virtualization Manager.

Defining baselines

You can define baselines for individual entities, and for multiple resources at once.

To define a baseline for an individual vNode:

1. Click **Edit thresholds** on the resource, and then select the thresholds you want to edit.
2. Select **Override Global Orion Threshold or Set Dynamic Threshold**, and then set either a static threshold, or click **Use Dynamic Baseline Thresholds** to define a formula for calculating a baseline.
3. Click **Submit**.

To define a baseline for multiple vNodes at once:

1. Open **Settings > Node & Group Management > Manage Virtual Devices** in the Orion Web Console.
2. Click the Thresholds tab.
3. Select the entity type for which you want to configure a baseline threshold from the **Show** list:
 - Virtual Centers
 - Clusters
 - Hosts
 - Virtual Machines
 - Datastores
4. Select the vNodes for which you want to configure a baseline.
5. Click **Edit Thresholds**, and then select the thresholds you want to edit.
6. Select **Override Global Orion Threshold or Set Dynamic Threshold**, and then set either a static threshold, or click **Use Dynamic Baseline Thresholds** to define a formula for calculating a baseline.
7. Click **Submit**.

Note: To configure thresholds for, for example, all virtual machines under a given host, first select all vNodes, and then deselect the vNodes for which you do not want to define thresholds.

Understanding Object Statuses

The object statuses that are displayed in IVIM are determined automatically based on data polling.

Additionally, by configuring Warning and Critical level thresholds you can determine when an object should reach Warning or Critical state. For information about configuring thresholds, see [Setting Orion General Thresholds](#) in the *SolarWinds Orion Platform Administrator Guide*.

The tables in this section provide information about the statuses and their meaning, and about the status icons related to particular objects in different contexts.







The following statuses can apply to the following configuration items.

| Status | Applies to |
|----------|---|
| Down | <ul style="list-style-type: none"> Virtual Machine |
| Critical | <ul style="list-style-type: none"> Cluster Datastore Virtual Machine Host |
| Warning | <ul style="list-style-type: none"> Cluster Datastore Virtual |





| Status | Applies to |
|-------------|--|
| | Machine <ul style="list-style-type: none">• Host |
| Up | <ul style="list-style-type: none">• Cluster• vCenter• Datastore• Virtual Machine• Host |
| Unknown | <ul style="list-style-type: none">• Cluster• vCenter• Datastore• Virtual Machine• Host |
| Unreachable | <ul style="list-style-type: none">• vCenter• Host |
| Unmanaged | <ul style="list-style-type: none">• vCenter• Host |

The following tables provide information about the individual status icons and their meaning.






vCenter

| Status | Icon | Description |
|------------------|---|--|
| Up |  | The vCenter is connected and running without problems. |
| Unknown |  | The vCenter has not been polled recently. |
| Unreachable |  | The vCenter and the vCenter node cannot be polled. The parent node is down and it is not possible to connect to the vCenter. |
| Unmanaged |  | The vCenter is set as Unmanaged in the Manage Nodes page of IVIM. |
| Could not poll |  | The vCenter cannot be polled because of a connection or credentials issue. |
| Disabled polling |  | The polling of the vCenter has been set to Disabled in the Virtualization Polling Settings of IVIM. |





Datacenter













| Status | Icon | Description |
|----------|---|--|
| Critical |  | The status is inherited from child objects. The cluster or ESX (i) host is in a critical state. |
| Warning |  | The status is inherited from child objects. The cluster or ESX (i) host is in a warning state. |
| Up |  | The status is inherited from child objects. The cluster or ESX (i) host is running without problems. |
| Unknown |  | The status is inherited from the parent object. The vCenter is in an Unknown, Unmanaged, Unreachable, or Could not poll state. |

Cluster














| Status | Icon | Description |
|------------------|---|---|
| Critical |  | In a VMware environment, the cluster reached a critical level threshold in vSphere. In a Hyper-V environment, the cluster is reported as Up. |
| Warning |  | In a VMware environment, the cluster reached a warning level threshold in vSphere. In a Hyper-V environment, the cluster is reported as Up. |
| Up |  | There are no critical or warning level alerts active for the cluster in vSphere. |
| Unknown |  | The status is inherited from the parent object. The data-center or vCenter is in an Unknown, Unmanaged, Unreachable, or Could not poll state. |
| Disabled polling |  | The status is inherited from the parent object. The polling of the vCenter has been set to Disabled in the Virtualization Polling Settings in IVIM. |

Host










| Status | Icon for ESX (i) | Icon for Hyper-V | Description |
|----------|---|---|---|
| Critical |  |  | The host reached a critical level threshold, or in a VMware environment, a critical alert on the host is active in vSphere. |
| Warning |  |  | The host reached a warning level threshold, or in a VMware environment, a warning alert |

| Status | Icon for ESX (i) | Icon for Hyper-V | Description |
|------------------|---|---|---|
| | | | on the host is active in vSphere. |
| Up |  |  | The host is connected and running without problems. |
| Unknown |  |  | Either the host has not been polled recently, or the status is inherited from the parent object, and the parent vCenter is in an Unknown, Unmanaged, Unreachable, or Could not poll state. |
| Unreachable |  |  | The host cannot be polled. The parent node is down and it is not possible to connect to the host. |
| Unmanaged |  |  | The host is set as Unmanaged in the Manage Nodes page of IVIM. |
| Could not poll |  |  | The host cannot be polled because of a connection or credentials issue. |
| Disabled polling |  |  | Either the polling of the host has been set to Disabled in the Virtualization Polling Settings of IVIM, or the status is inherited from the parent object, and the polling of the parent vCenter has been set to Disabled in the Virtualization Polling Settings of IVIM. |

Virtual Machine

| Status | Icon for VMware | Icon for Hyper-V | Description |
|------------------|---|---|---|
| Down | - |  | The Hyper-V virtual machine is shut down and is in a critical state. |
| Shutdown |  |  | The virtual machine is shut down. |
| Critical |  |  | The virtual machine reached a critical level threshold, or in a VMware environment, a critical alert on the virtual machine is active in vSphere. |
| Warning |  |  | The virtual machine reached a warning level threshold, or in a VMware environment, a warning alert on the virtual machine is active in vSphere. |
| Up |  |  | The virtual machine is connected and running without problems. |
| Unknown |  |  | The status is inherited from the parent objects. The ESX(i) or Hyper-V host, and the items above are in an Unknown, Unmanaged, Unreachable, or Could not poll state. |
| Disabled polling |  |  | The status is inherited from the parent objects. The polling of the ESX(i) or Hyper-V host, and the items above have been set to Disabled in the Virtualization Polling Settings of IVIM. |

AppStack Environment View and AppStack Environment resource

| Status | Icon | Description |
|------------------|---|--|
| Down |  | The item is shut down or is in a critical state. |
| Shutdown |  | The item is shut down. |
| Critical |  | The item is in a critical state. The item has reached a critical level threshold. |
| Warning |  | The item is in a warning state. The item has reached a warning level threshold. |
| Up |  | The item is running without problems. |
| Unknown |  | The item has not been polled recently. |
| Unreachable |  | The item cannot be reached and polled. |
| Unmanaged |  | The item is set as Unmanaged in the Manage Nodes page of IVIM. |
| Disabled polling |  | The polling of the item has been set to Disabled in the Virtualization Polling Settings of IVIM. |

Creating virtualization alerts in the Orion Alert Manager

After integrating IVIM with Virtualization Manager, you can define alerts in the Orion web console that are based on data collected by Virtualization Manager. You can use virtualization alerts which are included in the product by default, and you can also build your custom alerts in the Alert Manager.

For information about creating and editing alerts in the Alert Manager, see [Creating New Alerts](#) and the related topics in the *SolarWinds Orion Platform Administrator Guide*.

If IVIM is not integrated with Virtualization Manager, virtualization alerts are not available by default. However, you can create your own alerts for the following object types:

- Virtual cluster
- Virtual host
- Virtual machine

If IVIM is integrated with Virtualization Manager, virtualization alerts are available by default. If you remove the integration, these virtualization alerts will be disabled, but you can still create your own alerts for the following object types:

- Virtual cluster
- Virtual datastore
- Virtual host
- Virtual machine

For information about integrating IVIM with Virtualization Manager, see [Integrating IVIM with Virtualization Manager](#).

Creating virtualization reports in the Orion Report Manager

After integrating IVIM with Virtualization Manager, you can define reports in the Orion web console that are based on data collected by Virtualization Manager. You can use virtualization reports which are included in the product by default, and you can also build your custom report in the Report Manager.

For information about creating and editing reports in the Report Manager, see [Creating a new web-based report](#) and the related topics in the *SolarWinds Orion Platform Administrator Guide*.

To be able to use virtualization reports in the Report Manager, IVIM and Virtualization Manager must be integrated. If the integration is removed, the default virtualization reports are not available in the Report Manager.

For information about integrating IVIM with Virtualization Manager, see [Integrating IVIM with Virtualization Manager](#).

Viewing related entities in the Orion web console

The Application Stack or AppStack Environment view provides visibility into the relations existing between the different entities on your network. It provides an in-depth perspective through the entire environment to help identify the root cause of performance and availability issues.

AppStack is available in the following versions of Orion platform products:

- Storage Resource Monitor 6.0
- Integrated Virtual Infrastructure Monitor 2.0
- Server & Application Monitor 6.2
- Web Performance Monitor 2.2

If you own two or more of the listed products, AppStack will not function properly unless each product is upgraded to the previously listed versions.

You can reach the AppStack Environment view by navigating to **Home > Environment** in the Orion web console.

Through the AppStack Environment view, you can visualize and navigate the entire infrastructure that an application is using. Additionally, you can see what other loads on the infrastructure can be affecting a particular application.

The following virtualization entities are part of the AppStack Environment:

- Virtual Centers
- VMware datacenters
- Virtual clusters

- Virtual hosts
- Virtual machines
- Data stores

Apart from the AppStack Environment view, you can also use the AppStack Environment resource. The AppStack Environment resource is available on the Details pages of individual entities, and it displays objects that are related to the particular entity whose Details page you are viewing.

For more information about the AppStack Environment view, see [Introduction to the AppStack Environment View](#) and the related topics in the *SolarWinds Server and Application Monitor Administrator Guide*.

For more information about the AppStack Environment resource, see [AppStack Environment Resource](#) in the *SolarWinds Network Performance Monitor Administrator Guide*, and [Understanding the AppStack Resource](#) in the *SolarWinds Server and Application Monitor Administrator Guide*.

Viewing storage infrastructure information in the Orion web console

Installing Storage Resource Monitor (SRM) along with IVIM provides insight into the physical storage environment that corresponds to the virtual environment. By installing both IVIM and SRM, you can gain an overall view of your physical storage infrastructure.

If SRM is installed alongside IVIM, the storage information about LUNs that is displayed in IVIM is directly linked to the information stored in SRM. By clicking the links displayed in IVIM resources, you can reach the corresponding Details page of the particular storage volume and get detailed information about it.

The storage related information is only visible in IVIM if a mapping exists between a storage volume and the virtualization volume entity, and if IVIM is integrated with Virtualization Manager. For information about integrating IVIM with

Virtualization Manager, see [Preparing for the integration of Virtualization Manager](#).

For information about installing SRM, see [Installing Storage Resource Monitor](#) in the *SolarWinds Storage Resource Monitor Administrator Guide*.

For detailed information about the features of SRM, see the [Storage Resource Monitor Administrator Guide](#).

Note: If Virtualization Manager is integrated with Storage Manager (STM), the links to STM are displayed in the IVIM resources even if the SRM module is not installed. For information about integrating Virtualization Manager with STM, see [Configuring the Storage Manager installation details](#).

Monitoring hardware health in IVIM

By monitoring the hardware health of nodes, you can get information about the status of hardware components such as fans, batteries, and power supplies.

If hardware health monitoring is enabled, you can use the following hardware health resources on the Managed ESX Host Details view in IVIM. Click the links for more information about each resource.

- [Current Hardware Health](#)
- [Hardware Details](#)
- [Hardware Health](#)

The following resource is displayed on the Virtualization Summary view. Click the link for more information about the resource.

- [Hardware Health Overview](#)



Chapter 18: Integrated Virtualization Infrastructure Monitor resources

The following sections provide detailed information about the specific Integrated Virtualization Manager resources that are available in the Orion Web Console.

For information about integrating SolarWinds Virtualization Manager with SolarWinds Orion Platform products, see [Preparing for the integration of Virtualization Manager](#).

Active Virtualization Alerts

This resource, available on the Datastore, Cluster, Host and VM detail views, provides a running list of alerts related to a datastore, cluster, host, or VM. The list also includes alerts raised for related entities.

The table contains the following information:

- Time of alert
- Name of the device
- Additional information about the alert

Applications on this Datastore

This resource, available on the Datastore Details view, provides a table with the following information about applications using the datastore:

- Application Name
- Status (up or down)
- Node (where application is installed)

Click **Edit** to adjust the title or subtitle.

Notes:

- A *datastore* refers to a VMWare datastore, Hyper-V local storage, or Hyper-V cluster shared volumes (CSV) that clusters, hosts, and VMs can be assigned to share.
- To determine associations of VMs and datastores on Hyper-V environments, Virtualization Manager identifies what the system regards as the default location or datastore for vm and vhd files. All VMs managed by a hypervisor are automatically associated with this default datastore.

Component Volumes

This resource, available on the **Node Details > Storage** view, provides a table with the following information about the node:

- Mount Point
- Capacity
- Free Space
- Used (%)
- Virtual Disk

Click **Edit** to adjust the title and the warning and critical thresholds.

Datacenter Details

This resource displays a table of useful information about the current datacenter.

Hover over the Virtual Center Name to see additional information about the vCenter.

Datacenter Details view

The Datacenter Details view contains resources which provide information about the status of the particular datacenter and about how the datacenter is related to other virtualization or storage entities in your environment.

To modify the view, click **Customize Page** at the top right corner of the view.

Datacenters with Problems

This resource provides a list of datacenters that experience problems, complete with the description of the problem.

Click **Edit** to modify the following settings of the resource:

- Title
- Subtitle
- Maximum number of objects to display
- Filter by object status

Datastore Info

This resource, available on the Datastore Details view, provides a table with the following data store usage information:

- Status (online/offline)
- Type (NAS, SAN, JBOD)
- Location
- Storage Full By (date)

Click **Edit** to adjust the title or subtitle.

Notes:

- A *datastore* refers to a VMWare datastore, Hyper-V local storage, or Hyper-V cluster shared volumes (CSV) that clusters, hosts, and VMs can be assigned to share.
- To determine associations of VMs and datastores on Hyper-V environments, Virtualization Manager identifies what the system regards as the default location or datastore for vm and vhd files. All VMs managed by a hypervisor are automatically associated with this default datastore.

Datastore IOPS and Latency

This resource, available on the Datastore Details view, provides averages for the IOPS and latency for VMs using the datastores.

The measure for IOPS shows averages for the set intervals. By default, the intervals are for the last hour, last 24 hours, and last 30 days. The measure for latency shows the average for the selected interval, in milliseconds.

Clicking either the Datastore IOPS or Datastore Latency measure opens the relevant datastore details resource.

- [IOPS \(Datastore and its Top VMs\)](#)
- [Latency \(Datastore and its Top VMs\)](#)

Click **Edit** to adjust the gauge style and size.

Note: A *datastore* refers to a VMWare datastore, Hyper-V local storage, or Hyper-V cluster shared volumes (CSV) that clusters, hosts, and VMs can be assigned to share.

Effective CPU Load

This chart displays the CPU load of the cluster as a whole.

To get a more detailed view of the CPU load of the cluster, click the zoom buttons, or move the slider to cover the time period you want.

To view the exact CPU load percentages at a given point in time, hover over the appropriate bar in the chart.

Click **Export** to get a printable and exportable version of the chart.

Effective Memory Load

This chart displays the memory load of the cluster as a whole.

To get a more detailed view of the memory load of the cluster, click the zoom buttons, or move the slider to cover the time period you want.

To view the exact memory load percentages at a given point in time, hover over the appropriate bar in the chart.

Click **Export** to get a printable and exportable version of the chart.

ESX Host Details

This resource presents a table providing information about the selected ESX host, including its operational status, the physical memory installed on the host server, the number of VMs configured on the host server, and the vCenter through which the host is polling.

Hover over the vCenter for additional details about the vCenter.

Click **Edit Host** to manage the alerting threshold properties of the host.

Guests with Problems

This resource provides a list of guests that experience problems, complete with the machine type and the description of the problem.

Click **Edit** to modify the following settings of the resource:

- Title
- Subtitle
- Maximum number of objects to display
- Filter by object status
- Filter by vendor

Host Details view

The Host Details view contains resources which provide information about the status of the particular host and about how the host is related to other virtualization or storage entities in your environment.

To modify the view, click Customize Page at the top right corner of the view.

Hosts with Problems

This resource provides a list of hosts that experience problems, complete with the machine type and the description of the problem.

Click **Edit** to modify the following settings of the resource:

- Title
- Subtitle
- Maximum number of objects to display
- Filter by object status
- Filter by vendor

IOPS (Datastore and its Top VMs)

This resource, available on the Datastore Details view, provides a graph of IOPS against adjustable intervals.

Hold your pointer over a graph line to see details on all VMs at the data point (IOPs at the specific date and time).

The table below the chart provides the following information:

- VM nodes by name
- Overall IOPS
- Read IOPS
- Write IOPS
- Cluster with which the VM node is associated

Click **Edit** to adjust the zoom range (controlled by the slider), the amount of historical data to load (for example, Last 1 Day), and the sample interval (for example, 6 hours).

Click **Export** to convert chart data into XLS or HTML format. You can adjust the title, the default zoom range, the time period, the sample interval, and the chart size in preparation for export.

Notes:

- A *datastore* refers to a VMWare datastore, Hyper-V local storage, or Hyper-V cluster shared volumes (CSV) that clusters, hosts, and VMs can be assigned to share.
- To determine associations of VMs and datastores on Hyper-V environments, Virtualization Manager identifies what the system regards as the default location or datastore for vm and vhd files. All VMs managed by a hypervisor are automatically associated with this default datastore.

Latency (Datastore and its Top VMs)

This resource, available on the Datastore Details view, provides a graph of latency against adjustable intervals of daily time.

Hold your pointer over a graph line to see details on all VMs at the data point (latency at a specific date and time).

The table below the chart provides the following information:

- VM nodes by name
- Overall latency
- Read latency
- Write latency
- Cluster with which the VM node is associated

Click **Edit** to adjust the zoom range (controlled by the slider), the amount of historical data to load (for example, Last 1 Day), and the sample interval (for example, 6 hours).

Click **Export** to convert chart data into XLS or HTML format. You can adjust the title, the default zoom range, the time period, the sample interval, and the chart size in preparation for export.

Notes:

- A *datastore* refers to a VMWare datastore, Hyper-V local storage, or Hyper-V cluster shared volumes (CSV) that clusters, hosts, and VMs can be assigned to share.
- To determine associations of VMs and datastores on Hyper-V environments, Virtualization Manager identifies what the system regards as the default location or datastore for vm and vhd files. All VMs managed by a hypervisor are automatically associated with this default datastore.

Learn More about VMan Roles

This resource provides a list of configurations date-time stamped with the time of download. Clicking a configuration takes you to the configuration details.

To modify how many configuration changes to display in the list, click **Edit**.

Note: Orion NPM Web Console resources only display data representative of the intersection of nodes between the Orion NPM Web Console and the Orion NCM Web Console.

List of Virtual Hosts

This resource lists the virtual hosts that belong to the cluster, and provides a high-level summary of their utilization.

Hover over a host name to see additional information about the virtual host.

Overall Number of Running vs. Total VMs

This resource displays a summary of how many VMs are currently running.

To get a more detailed view of the number of running VMs, click the zoom buttons, or move the slider to cover the time period you want.

To view the number of running or not running VMs at a given point in time, hover over the appropriate bar in the chart.

Click **Export** to get a printable and exportable version of the chart.

Percent Availability

This chart displays the availability of the cluster.

To get a more detailed view of the cluster availability, click the zoom buttons, or move the slider at the bottom of the chart to cover the time period you want.

To view the exact availability percentage at a given point in time, hover over the appropriate bar in the chart.

Click **Export** to get a printable and exportable version of the chart.

Percent Memory Used

This chart displays the memory usage of the cluster as a whole.

To get a more detailed view of the memory usage of the cluster, click the zoom buttons, or move the slider to cover the time period you want.

To view the exact used memory percentages at a given point in time, hover over the appropriate bar in the chart.

Click **Export** to get a printable and exportable version of the chart.

Predicted Datastore Space Depletion

This resource, available on the Virtualization Storage Summary view, provides a table with the following information:

- Datastore (name)
- Free Space (GB)
- Capacity (GB)
- Storage Full By (estimated date)

Hover over a datastore name to see [Datastore Info](#).

Click **Edit** to adjust the resource title and the maximum number of datastores to display.

Notes:

- A *datastore* refers to a VMWare datastore, Hyper-V local storage, or Hyper-V cluster shared volumes (CSV) that clusters, hosts, and VMs can be assigned to share.
- To determine associations of VMs and datastores on Hyper-V environments, Virtualization Manager identifies what the system regards as the default location or datastore for vm and vhd files. All VMs managed by a hypervisor are automatically associated with this default datastore.

Predicted VM Disk Depletion

This resource, available on the Virtualization Storage Summary view, provides a table with the following information:

- Node (VM)
- Free (%)
- Capacity
- Free Space (GB)

Hover over a datastore name to see [Datastore Info](#).

Click **Edit** to adjust the resource title and the maximum number of datastores to display.

Notes:

- A *datastore* refers to a VMWare datastore, Hyper-V local storage, or Hyper-V cluster shared volumes (CSV) that clusters, hosts, and VMs can be assigned to share.
- To determine associations of VMs and datastores on Hyper-V environments, Virtualization Manager identifies what the system regards as

the default location or datastore for vm and vhd files. All VMs managed by a hypervisor are automatically associated with this default datastore.

Resource Utilization

This resource, available on the Virtualization Summary subview under an ESX host detail or a VM detail, provides the resource utilization values for nodes. The VM detail view of the resource shows the resource utilization values for a specific VM and its host. The Host detail view shows the resource utilization values for a specific host and for the VM with the top resource consumption under the host.

The Host detail view of this resource displays the following resource utilization values:

- CPU - This host
- CPU - Top VM
- Memory - This host
- Memory - Top VM
- Network utilization - This host
- Network utilization - Top VM
- IOPS - Top VM
- Latency - Top VM

Note: Every top utilization value can correspond to a different virtual machine.

The VM detail view of this resource displays the following resource utilization values:

- CPU - This VM
- CPU - Host
- Memory - This VM
- Memory - Host

- Network utilization - This VM
- Network utilization - Host
- IOPS - This VM
- Latency - This VM
- CPU Ready - This VM

Setup Virtualization Manager Integration

This resource accepts input that integrates the Virtualization Manager server into the Orion Web Console of your Orion platform product.

To integrate Virtualization Manager:

1. Enter the appropriate information about your Virtualization Manager instance.
 - a. Enter the server name or IP address of the Virtualization Manager server.
 - b. Enter the port number (443 is the default) on which the Virtualization Manager expects to service web requests.
 - c. Enter the user name and password that can access the Virtualization Manager web console.
2. Click **Submit**.

Storage Summary

This resource, available on the **Node Details > Storage** view, provides the following information about storage:

- Host Server
- Datastore that the host is using, including its size, free space, IOPS, latency
- LUN ID/Path

Click **Edit** to adjust the type of information to display.

Note: A *datastore* refers to a VMWare datastore, Hyper-V local storage, or Hyper-V cluster shared volumes (CSV) that clusters, hosts, and VMs can be assigned to share.

Top Datastore I/O Latency

This resource, available on the Virtualization Storage Summary view, provides a graph of IO latency in milliseconds against a date or time period.

Hold your pointer over a graph line to see details on all data stores at the data point (latency at the specific date and time).

The table below the graph provides the following information:

- Node
- Latency (total in ms)
- Read (ms)
- Write (ms)
- Cluster with which the node is associated

Click **Edit** to adjust the zoom range (controlled by the slider), the amount of historical data to load (for example, Last 1 Day), and the sample interval (for example, 6 hours).

Click **Export** to convert chart data into XLS or HTML format. You can adjust the title, the default zoom range, the time period, the sample interval, and the chart size in preparation for export.

Notes:

- A *datastore* refers to a VMWare datastore, Hyper-V local storage, or Hyper-V cluster shared volumes (CSV) that clusters, hosts, and VMs can be assigned to share.
- To determine associations of VMs and datastores on Hyper-V environments, Virtualization Manager identifies what the system regards as

the default location or datastore for vm and vhd files. All VMs managed by a hypervisor are automatically associated with this default datastore.

Top Datastore IOPS

This resource provides a graph of IOPS against a date or time period.

Hover over a graph line to see details on all datastores at the data point (latency at the specific date and time). Hover over a node to see [Datastore Info](#).

The table below the graph provides the following information:

- Node
- IOPS (total)
- Read
- Write
- Cluster with which the node is associated.

Click **Edit** to adjust the zoom range (controlled by the slider), the amount of historical data to load (for example, Last 1 Day), and the sample interval (for example, 6 hours).

Click **Export** to convert chart data into XLS or HTML format. You can adjust the title, the default zoom range, the time period, the sample interval, and the chart size in preparation for export.

Notes:

- A *datastore* refers to a VMWare datastore, Hyper-V local storage, or Hyper-V cluster shared volumes (CSV) that clusters, hosts, and VMs can be assigned to share.
- To determine associations of VMs and datastores on Hyper-V environments, Virtualization Manager identifies what the system regards as the default location or datastore for vm and vhd files. All VMs managed by a hypervisor are automatically associated with this default datastore.

Top VM IOPS

This resource provides a graph VM IOPS against a date or time period.

Hover over a graph line to see details about all VMs at the data point (IOPS at the specific date and time). Hover over a node to see VM information.

The table below the graph provides the following information:

- Node
- IOPS (total)
- Read
- Write
- Cluster with which the node is associated

Click **Edit** to adjust the zoom range (controlled by the slider), the amount of historical data to load (for example, Last 1 Day), and the sample interval (for example, 6 hours).

Click **Export** to convert chart data into XLS or HTML format. You can adjust the title, the default zoom range, the time period, the sample interval, and the chart size in preparation for export.

Top VM Latency

This resource provides a graph VM IO latency (ms) against a date or time period.

Hover over a graph line to see details about all VMs at the data point (latency at the specific date and time). Hover over a node to see VM information.

The table below the graph provides the following information:

- Node
- Read (latency in ms)
- Write (latency in ms)
- Cluster with which the node is associated.

Click **Edit** to adjust the zoom range (controlled by the slider), the amount of historical data to load (for example, Last 1 Day), and the sample interval (for example, 6 hours).

Click **Export** to convert chart data into XLS or HTML format. You can adjust the title, the default zoom range, the time period, the sample interval, and the chart size in preparation for export.

Notes:

- A *datastore* refers to a VMWare datastore, Hyper-V local storage, or Hyper-V cluster shared volumes (CSV) that clusters, hosts, and VMs can be assigned to share.
- To determine associations of VMs and datastores on Hyper-V environments, Virtualization Manager identifies what the system regards as the default location or datastore for vm and vhd files. All VMs managed by a hypervisor are automatically associated with this default datastore.

Top XX Datastores by Low Free Space

This resource, available on the Virtualization Storage Summary view, provides a table with the following information:

- Datastore (name)
- Free (%)
- Capacity
- Free Space (GB)

Hover over a datastore name to see [Datastore Info](#).

Click **Edit** to adjust the resource title and the maximum number of datastores to display.

Notes:

- A *datastore* refers to a VMWare datastore, Hyper-V local storage, or Hyper-V cluster shared volumes (CSV) that clusters, hosts, and VMs can be

assigned to share.

- To determine associations of VMs and datastores on Hyper-V environments, Virtualization Manager identifies what the system regards as the default location or datastore for vm and vhd files. All VMs managed by a hypervisor are automatically associated with this default datastore.

Top XX Hosts by CPU Load

This resource ranks hosts by CPU utilization.

Hover over a host name to see additional details about the host.

To change how many hosts are listed:

1. Click **Edit**.
2. Enter the number of hosts to list in the **Maximum Number of Hosts to Display** field.

To filter the host list based on properties:

1. Click **Edit**.
2. Enter the SWQL filter in the **Filter Guests** field. For more information, see the [Filter Syntax Guide](#) in the *Orion Platform Administrator Guide*.

Top XX Hosts by Network Utilization

This resource ranks hosts by network utilization.

Hover over a host name to see additional details about the host.

To change how many hosts are listed:

1. Click **Edit**.
2. Enter the number of hosts to list in the **Maximum Number of Hosts to Display** field.

To filter the host list based on properties:

1. Click **Edit**.
2. Enter the SWQL filter in the **Filter Hosts** field. For more information, see the [Filter Syntax Guide](#) in the *Orion Platform Administrator Guide*.

Top XX Hosts by Number of Running VMs

This resource ranks hosts by how many virtual machines each runs.

Hover over a host name to see additional information about the host.

To change how many hosts are listed:

1. Click **Edit**.
2. Enter the number of hosts to list in the **Maximum Number of Hosts to Display** field.

To filter the host list based on properties:

1. Click **Edit**.
2. Enter the SWQL filter in the **Filter Hosts** field. For more information, see the [Filter Syntax Guide](#) in the *Orion Platform Administrator Guide*.

Top XX Hosts by Percent Memory Used

This resource ranks hosts by memory utilization.

Hover over a host name to see additional details about the host.

To change how many hosts are listed:

1. Click **Edit**.
2. Enter the number of hosts to list in the **Maximum Number of Hosts to Display** field.

To filter the host list based on properties:

1. Click **Edit**.
2. Enter the SWQL filter in the **Filter Hosts** field. For more information, see the [Filter Syntax Guide](#) in the *Orion Platform Administrator Guide*.

Top XX Managed Virtual Guests by Current Response Time

This resource lists the guests with the worst response times.

To change how many guests are listed:

1. Click **Edit**.
2. Enter the number of hosts to list in the **Maximum Number of Hosts to Display** field.

To filter the guest list based on properties:

1. Click **Edit**.
2. Enter the SWQL filter in the **Filter Guests** field. For more information, see the [Filter Syntax Guide](#) in the *Orion Platform Administrator Guide*.

Top XX Managed Virtual Guests by CPU

This resource lists the guests with the most CPU usage.

To change how many guests are listed:

1. Click **Edit**.
2. Enter the number of hosts to list in the **Maximum Number of Hosts to Display** field.

To filter the guest list based on properties:

1. Click **Edit**.
2. Enter the SWQL filter in the **Filter Guests** field. For more information, see the [Filter Syntax Guide](#) in the *Orion Platform Administrator Guide*.

Top XX Managed Virtual Guests by Memory

This resource lists the guests with the highest memory usage.

To change how many guests are listed:

1. Click **Edit**.
2. Enter the number of hosts to list in the **Maximum Number of Hosts to Display** field.

To filter the guest list based on properties:

1. Click **Edit**.
2. Enter the SWQL filter in the **Filter Guests** field. For more information, see the [Filter Syntax Guide](#) in the *Orion Platform Administrator Guide*.

Top XX Managed Virtual Guests by Network Utilization

This resource lists the guests with the highest network usage.

To change how many guests are listed:

1. Click **Edit**.
2. Enter the number of hosts to list in the **Maximum Number of Hosts to Display** field.

To filter the guest list based on properties:

1. Click **Edit**.
2. Enter the SWQL filter in the **Filter Guests** field. For more information, see the [Filter Syntax Guide](#) in the *Orion Platform Administrator Guide*.

Top XX Managed Virtual Guests by % Packet Loss

This resource lists the guests with the worst packet loss percentages.

To change how many guests are listed:

1. Click **Edit**.
2. Enter the number of hosts to list in the **Maximum Number of Hosts to Display** field.

To filter the guest list based on properties:

1. Click **Edit**.
2. Enter the SWQL filter in the Filter Guests field. For more information, see the [Filter Syntax Guide](#) in the *Orion Platform Administrator Guide*.

Top XX VMs by Allocated Space

This resource, available on the Datastore Details view, provides a chart of VMs with the largest allocated storage space, plotting storage used against capacity, and extrapolating a full storage projection based on the current trend.

The table below the chart provides the following information:

- VM nodes by name
- (Storage) Used (%)
- (Storage) Capacity
- Storage Full By (date)

Click **Edit** to adjust the maximum number of VMs to display.

Notes:

- A *datastore* refers to a VMWare datastore, Hyper-V local storage, or Hyper-V cluster shared volumes (CSV) that clusters, hosts, and VMs can be assigned to share.
- To determine associations of VMs and datastores on Hyper-V environments, Virtualization Manager identifies what the system regards as the default location or datastore for vm and vhd files. All VMs managed by a hypervisor are automatically associated with this default datastore.

Top XX VMs by Low Storage Space

This resource, available on the Datastore Details view, provides a chart of VMs with the lowest available storage space, plotting storage used against capacity.

The table below the chart provides the following information:

- VM nodes by name
- (Storage) Used (%)
- (Storage) Capacity
- Cluster with which a VM node is associated

Click **Edit** to adjust the maximum number of VMs to display.

Notes:

- A *datastore* refers to a VMWare datastore, Hyper-V local storage, or Hyper-V cluster shared volumes (CSV) that clusters, hosts, and VMs can be assigned to share.
- To determine associations of VMs and datastores on Hyper-V environments, Virtualization Manager identifies what the system regards as the default location or datastore for vm and vhd files. All VMs managed by a hypervisor are automatically associated with this default datastore.

Top XX VMs by Overallocated CPU

This resource, available on the Sprawl view, provides a table with the following information about VMs with overallocated CPU:

- Node
- CPU (%)
- CPU Recommendation (increase/decrease by)

Hover over a VM to see details.

Click **Edit** to adjust the number of VMs to display.

Top XX VMs by Overallocated Memory

This resource, available on the Sprawl view, provides a table with the following information about VMs with overallocated memory:

- Node
- Mem (%)
- Mem Recommendation (increase/decrease by)

Hover over a VM to see details.

Click **Edit** to adjust the number of VMs to display.

Top XX VMs by Snapshot Disk Usage

This resource, available on the Sprawl view, provides a table with the following information about VMs:

- Node
- Snapshots (GB)
- Cluster with which node is associated
- Datastore with which node is associated

Hover over a VM or datastore to see details.

Click **Edit** to adjust the number of VMs and datastores to display.

Notes:

- A *datastore* refers to a VMWare datastore, Hyper-V local storage, or Hyper-V cluster shared volumes (CSV) that clusters, hosts, and VMs can be assigned to share.
- To determine associations of VMs and datastores on Hyper-V environments, Virtualization Manager identifies what the system regards as the default location or datastore for vm and vhd files. All VMs managed by a hypervisor are automatically associated with this default datastore.

Top XX VMs by Storage Consumed

This resource, available on the Virtualization Storage Summary view, provides a table with the following information:

- Node
- Free Space (GB)
- Capacity (GB)
- Storage Full By (estimated date)

Hover over a datastore name to see [Datastore Info](#).

Click **Edit** to adjust the resource title and the maximum number of datastores to display.

Notes:

- A *datastore* refers to a VMWare datastore, Hyper-V local storage, or Hyper-V cluster shared volumes (CSV) that clusters, hosts, and VMs can be assigned to share.
- To determine associations of VMs and datastores on Hyper-V environments, Virtualization Manager identifies what the system regards as the default location or datastore for vm and vhd files. All VMs managed by a hypervisor are automatically associated with this default datastore.

Top XX VMs by Underallocated CPU

This resource, available on the Sprawl view, provides a table with the following information about VMs with underallocated CPU:

- Node
- CPU (%)
- CPU Recommendation (increase/decrease by)

Hover over a VM to see details.

Click **Edit** to adjust the number of VMs to display.

Top XX VMs by Underallocated Memory

This resource, available on the Sprawl view, provides a table with the following information about VMs with underallocated memory:

- Node
- Mem (%)
- Mem Recommendation (increase/decrease by)

Hover over a VM to see details.

Click **Edit** to adjust the number of VMs to display.

Top XX VMs by Used Space

This resource, available on the Datastore Details view, provides a chart of VMs with the most storage space used, plotting storage used against capacity, and extrapolating a full storage projection based on the current trend.

The table below the chart provides the following information:

- VM nodes by name
- (Storage) Used (%)

- (Storage) Capacity
- Storage Full By (date)

Click **Edit** to adjust the maximum number of VMs to display.

Note: A *datastore* refers to a VMWare datastore, Hyper-V local storage, or Hyper-V cluster shared volumes (CSV) that clusters, hosts, and VMs can be assigned to share.

Usage MHz

This chart displays how many CPU cycles are used by the cluster as a whole.

To get a more detailed view of the CPU cycles of the cluster, click the zoom buttons, or move the slider to cover the time period you want.

To view the exact CPU usage at a given point in time, hover over the appropriate bar in the chart.

Click **Export** to get a printable and exportable version of the chart.

Virtual Cluster Details

This resource provides a table of vital statistics regarding the cluster.

Click **Edit** to modify the resource title and subtitle.

Click **Edit Cluster** to modify the alerting thresholds corresponding to the cluster.

Virtual Disks and Related Storage Infrastructure

This resource, available on the **Node details > Storage** view, provides information about the virtual disks connected to a particular virtual machine, and about their capacity.

By expanding the details of a specific virtual disk, you can see information about the volumes, data stores, and LUNs connected to the virtual disk.

If your product is integrated with SolarWinds Storage Resource Monitor (SRM), you can click the name of the LUN for detailed information.

Virtual Machine Details view

The Virtual Machine Details view contains resources which provide information about the status of the particular virtual machine and about how the virtual machine is related to other virtualization or storage entities in your environment.

Besides viewing the status information, you can perform virtual machine management actions through the resources located in this view.

To modify the view, click **Customize Page** at the top right corner of the view.

Virtual Machine IOPS

This resource, available on the **Node Details > Storage** view, provides a graph of IOPS against adjustable intervals.

Select the VM or host to see IOPS charted for the VM, host, or both.

Hold your pointer over a graph line to see details on all VMs at the data point (IOPs at the specific date and time).

Click **Edit** to adjust the zoom range (controlled by the slider), the amount of historical data to load (for example, Last 1 Day), and the sample interval (for example, 6 hours).

Click **Export** to convert chart data into XLS or HTML format. You can adjust title, default zoom range, time period, sample interval, and chart size in preparation for export.

Virtual Machine IOPS and Latency

This resource, available on the **Node Details > Storage** view, provides averages for the IOPS and latency for the selected VM.

The measure for IOPS shows averages for the set intervals (by default, last hour, last 24 hours, last 30 days). The measure for latency shows the average (in milliseconds) for the selected interval.

Clicking either the VM IOPS or VM Latency measure opens the relevant VM details resource.

- [IOPS \(Datastore and its Top VMs\)](#)
- [Virtual Machine Latency](#)

Click **Edit** to adjust the gauge style and size.

Virtual Machine Latency

This resource, available on the **Node Details > Storage** view, provides a graph of latency against adjustable intervals.

Select the VM or host to see latency charted for the VM, host, or both.

Hold your pointer over a graph line to see details about all VMs at the data point (IOPs at the specific date and time).

Click **Edit** to adjust the zoom range (controlled by the slider), the amount of historical data to load (for example, Last 1 Day), and the sample interval (for example, 6 hours).

Click **Export** to convert chart data into XLS or HTML format. You can adjust the title, the default zoom range, the time period, the sample interval, and the chart size in preparation for export.

Virtualization Assets

This resource displays the virtual servers monitored by SolarWinds and also lists the individual virtual machines they host.

To add VMs from the Virtualization Assets Resource:

1. Click the **[+]** next to any virtual server listed in the **Virtualization Assets** resource to expand the list of virtual machines.
2. Click a virtual machine that is not currently managed by SolarWinds. Unmanaged VMs are listed in italic type.
3. Click **Yes, Manage this Node**.
4. If the VM is not running Virtual Tools, manually enter the IP address of the VM in the **Hostname or IP Address** field.

5. Select any additional options required to monitor the VM, and then click **Next**.
6. Follow the remainder of the Add Node wizard to completion, and then click **OK, Add Node**.

Virtualization Asset Summary

This resource presents a table providing a high-level summary of your virtualized infrastructure. The information is broken down into the following sections, depending on your virtual environment.

Overall

Number of Hosts

Indicates the total number of hosts you are monitoring.

Number of VMs

Indicates the total number of VMs you are monitoring, including information about the number of running VMs.

Total Number of Physical CPU Cores

Indicates the total number of CPU cores in your virtual infrastructure.

Total RAM

Indicates the total amount of memory in your virtual infrastructure.

Last Poll

Indicates the age of the summary information in your virtual infrastructure.

VMware

Number of Virtual Centers

Indicates the total number of servers you are monitoring.

Number of Clusters

Indicated the total number of clusters you are monitoring.

Resource Pools

Indicates the total number of non-clustered hosts.

ESX Hosts

Indicates the total number of ESX hosts you are monitoring.

Number of VMs

Indicates the total number of VMs you are monitoring in your VMware environment, including information about the number of running VMs.

Total Number of Physical CPU Cores

Indicates the total number of CPU cores in your VMware infrastructure.

Total RAM

Indicates the total amount of memory in your VMware infrastructure.

Last Poll

Indicates the age of the summary information in your VMware infrastructure.

Hyper-V

Number of Hosts

Indicates the total number of Hyper-V hosts you are monitoring.

Number of VMs

Indicates the total number of VMs you are monitoring in your Hyper-V environment, including information about the number of running VMs.

Total Number of Physical CPU Cores

Indicates the total number of CPU cores in your Hyper-V infrastructure.

Total RAM

Indicates the total amount of memory in your Hyper-V infrastructure.

Last Poll

Indicates the age of the summary information in your Hyper-V infrastructure.

Virtualization Manager Alerts

This resource provides a rolling list of alerts that pertain to the selected datastore.

Click **Edit** to adjust the number of items to display.

Virtualization Manager Tools

This resource provides links that directly navigate to Virtualization Manager tools such as the Virtualization Performance Explorer and the Virtualization Map, and put the selected object (datastore or virtual machine) in the context of the selected tool.

Additionally, basic management actions can also be performed directly from the Orion web console, without accessing your vSphere Client or SCVMM. You can perform the following power and snapshot management actions in the Orion web console:

- Power off virtual machines
- Suspend virtual machines
- Pause virtual machines
- Reboot virtual machines
- Take snapshots of virtual machines
- Delete snapshots of virtual machines

The availability of these options is controlled by Orion account limitations. If an option is not accessible, make sure that your account has the appropriate permission levels.

The availability of the options also depends on the current state of the virtual machine in context. For example, if the virtual machine is offline, the Power off VM option is not present.

Modifying the permissions

To modify the permissions, perform the following steps:

1. Navigate to **Settings > Manage Accounts** in the Orion web console.
2. Select the user whose permissions you want to modify, and then click **Edit**.

3. Expand the **Integrated Virtual Infrastructure Monitor Settings** grouping.
4. Modify the **Virtual Machine Power Management** and the **Snapshot Management** options, and then click **Submit**.

Virtualization Storage Summary

This resource, available on the Virtualization Storage Summary view, provides the following information about datastores and VMs:

Datastores:

- Number of datastores
- Total space
- Free space
- Oversubscribed
- Storage full (%)

Virtual Machines:

- Number of virtual machines
- Number of virtual machines powered on
- Average size
- Average IOPS
- Average latency

Notes:

- A *datastore* refers to a VMWare datastore, Hyper-V local storage, or Hyper-V cluster shared volumes (CSV) that clusters, hosts, and VMs can be assigned to share.
- To determine associations of VMs and datastores on Hyper-V environments, Virtualization Manager identifies what the system regards as

the default location or datastore for vm and vhd files. All VMs managed by a hypervisor are automatically associated with this default datastore.

Virtualization Volume Details

This resource is available on the storage volume details page, and provides the following information about the virtualization volume that is mapped to the storage volume:

- Volume name
- Datastore
- Virtual Disk

The resource also provides direct access to the Virtualization Storage Summary view.

Note: The resource is only displayed if a mapping exists between a storage volume and the virtualization volume entity, and if the integration with Virtualization Manager is enabled. For information about integrating IVIM with Virtualization Manager, see [Preparing for the integration of Virtualization Manager](#).

VMs Idle for the Last Week

This resource, available on the Sprawl view, provides a table with the following information about VMs idle for the last week:

- Node
- Week Average CPU
- Week Average IOPS
- Week Average Net

Hover over a VM to see details.

Click **Edit** to adjust the number of VMs to display.

VMs Powered Off for More Than 30 Days

This resource, available on the Sprawl view, provides a table with the following information about VMs that have been powered off for more than 30 days:

- Node
- Configured Memory
- Total Storage
- Last Powered on (Date/Time)

Hover over a VM to see details.

Click **Edit** to adjust the number of VMs to display.

VMs that might benefit from decreasing vCPUs

This resource, available on the Sprawl view, provides a table with the following information about VMs that can benefit from decreasing vCPUs:

- Node name
- CPU load
- Number of current vCPUs
- CPU costop

Hover over a VM to see its details.

Click **Edit** to edit the name and description of the resource.

Note: The costop counter information is only collected for VMware VMs. The CPU costop counter is available for API version 5.0 or later.

VMware vCenters with Problems

This resource provides a list of vCenters that experience problems, complete with the description of the problem.

Click **Edit** to modify the following settings of the resource:

- Title
- Subtitle
- Maximum number of objects to display
- Filter by object status

VMware Clusters with Problems

This resource provides a list of clusters that experience problems, complete with the description of the problem.

Click **Edit** to modify the following settings of the resource:

- Title
- Subtitle
- Maximum number of objects to display
- Filter by object status



Appendix A: Troubleshooting Hyper-V discovery

The following section provides troubleshooting information for Hyper-V discovery and collection on Virtualization Manager.

Why does Virtualization Manager not receive information from Hyper-V Hosts?

If you have never been able to discover or collect information from Hyper-V hosts, one of the following conditions may be true:

- Missing administrative credentials
- WMI is not enabled
- WMI Counters must be reset
- Firewall is misconfigured
- DCOM is not enabled
- UAC is enabled
- RPC is not enabled

If these conditions are not met, Virtualization Manager cannot collect information from the Hyper-V host.

If data collection stops after the initial setup, it can be related to new security policies or a group policy that supersedes your changes. This document is not intended to troubleshoot this scenario.

For further troubleshooting information, see the [Microsoft TechNet](#) and the [Microsoft Developer Network](#) websites, and search for WMI troubleshooting.

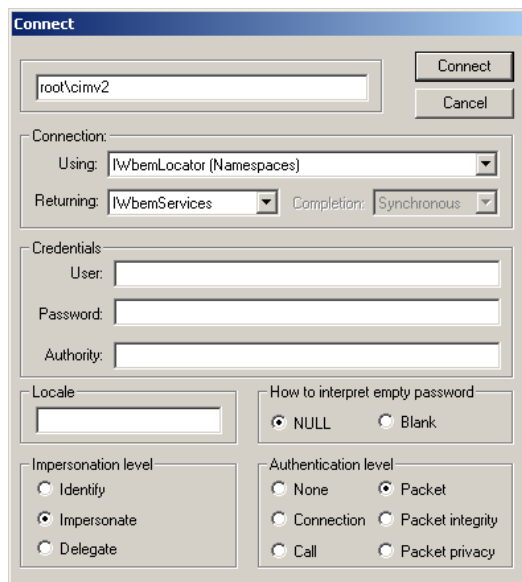
Testing local WMI services

Testing the local WMI ensures that the Hyper-V host can be monitored and queried remotely. The test software, WBEMTest, is included with Microsoft Windows operating systems.

Testing WMI on the target server

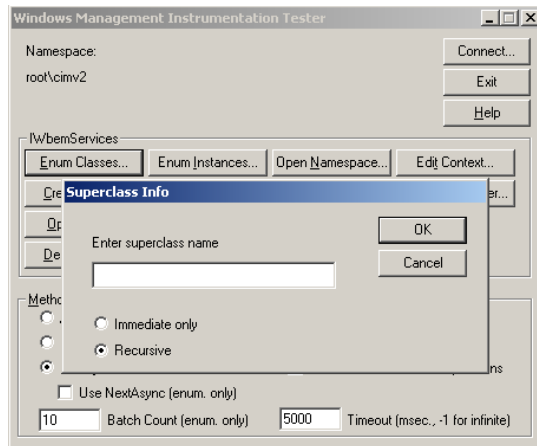
Complete the following procedure to check whether WMI on the target server is functioning correctly:

1. Log on to the target server with an administrator account.
2. Click **Start > Run**, type `wbemtest.exe`, and then click **OK**.
3. Click **Connect** on the Windows Management Instrumentation Tester window.
4. Type `root\cimv2` in the field at the top of the window next to the **Connect** button.

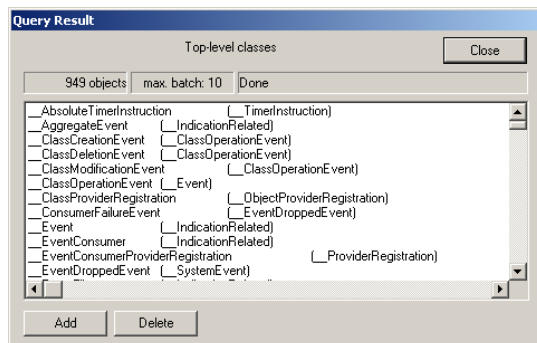


5. Click **Connect**.
6. Click **Enum Classes**.

7. Select the **Recursive** radio button without entering a superclass name, and then click **OK**.



8. If the WMI class you are querying appears in this list, local WMI services are functioning correctly. Skip to the next topic and test remote WMI.



9. If the list does not appear or does not contain the WMI class you want, WMI is not functioning correctly. Continue reading this section to repair WMI services on the target server.
10. Click **Close**, and then click **Exit**.

Resetting the WMI counters

At times, the WMI performance counters may not get transferred to WMI because services were delayed or started out of order. For more information, see the article

at the [Microsoft Knowledge Base](#).

To manually reset the WMI counters:

1. Stop the **Windows Management Instrumentation** service.
2. Click **Start**, click **Run**, type `cmd`, and then click **OK**.
3. At the command prompt, type `winmgmt /resyncperf`, and then press enter.
4. At the command prompt, type `wmiadap.exe /f`, and then press enter.
5. Type `exit`, and then press enter to close the command prompt.
6. Start the **Windows Management Instrumentation** service.
7. After resetting the WMI counters, retest WMI.

Note: For further troubleshooting information, see the [Microsoft TechNet](#) and the [Microsoft Developer Network](#) websites, and search for WMI troubleshooting.

Testing remote WMI connectivity

Testing the remote WMI connectivity of the target server helps you isolate faults that could prevent the target server from receiving or responding to remote WMI requests. The test software, WBEMTest, is included with Microsoft Windows operating systems.

Remotely testing WMI on the target server

Complete the following procedure to check whether the target server is responding appropriately to remote WMI requests that originate from SolarWinds Virtualization Manager:

1. Log on to a different Windows server with an administrator account.
2. Click **Start > Run**, type `wbemtest.exe`, and then click **OK**.
3. Click **Connect** on the Windows Management Instrumentation Tester window.
4. Type `\\Target_Primary_IP_Address\root\cimv2` in the field at the top of the dialog box, where `Target_Primary_IP_Address` is the host name or primary

IP address of the target server.

The screenshot shows the 'Connect' dialog box. The 'Using' dropdown is set to 'IwbemLocator (Namespaces)' and the 'Returning' dropdown is set to 'IwbemServices'. The 'Completion' dropdown is set to 'Synchronous'. In the 'Credentials' section, the 'User' field contains 'Administrator', the 'Password' field is masked with asterisks, and the 'Authority' field contains 'NTLMDOMAIN:NameOfDomain'. The 'Locale' field is empty. Under 'How to interpret empty password', the 'NULL' radio button is selected. Under 'Impersonation level', the 'Impersonate' radio button is selected. Under 'Authentication level', the 'Packet' radio button is selected.

5. Type the user name and the password in the relevant fields, and type `NTLMDOMAIN:NameOfDomain` in the **Authority** field, where `NameOfDomain` is the domain of the user account specified in the User field.
6. Click **Connect**.
7. Click **Enum Classes**.

Verifying the administrator credentials

Only credentials that have administrator rights on the Hyper-V host have the necessary permissions to access the WMI services of the host. Make sure that the user name and password you use belongs to an administrator on the target server.

If the administrator credential is a domain member, specify both the user name and the domain in the standard Microsoft syntax. For example:

`DOMAIN\Administrator.`

Complete the following procedure on each Hyper-V host server to ensure that the account specified in the credential store has the appropriate permissions.

Note: If you use a local user account that is added to the administrator group, you need to explicitly grant permissions in the WMI section.

To add your monitor account to the local administrator group of a Windows Server 2008 computer:

1. Log on to the computer you want to monitor with an administrator account.
2. Navigate to **Start > Control Panel > Administrative Tools > Computer Management > Local Users and Groups > Groups**. Switch to the Classic View of the Control Panel to use this navigation path.
3. Right-click **Administrators**, and then click **Add to group**.
4. If the account you want to use is not currently a member of this group, complete the following procedure:
 - a. Click **Add** on the Administrators Properties window.
 - b. Type the name of the account you want to use to gather WMI statistics, and then click **OK**. This is the account you specify in the credentials section.

Note: If you add an account to a workgroup computer, you cannot add a domain account. You must use a local account.
5. Click **OK** on the Administrators Properties window, and then close the Computer Management window.

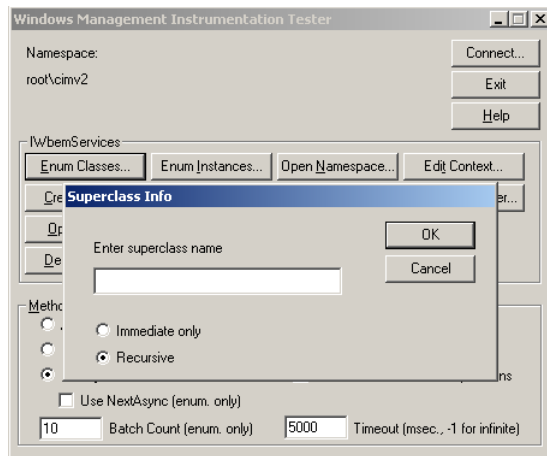
Enabling Remote Procedure Call (RPC)

Remote WMI connections use RPC as a communications interface. If the RPC service is disabled on the target server, remote WMI connections cannot be established.

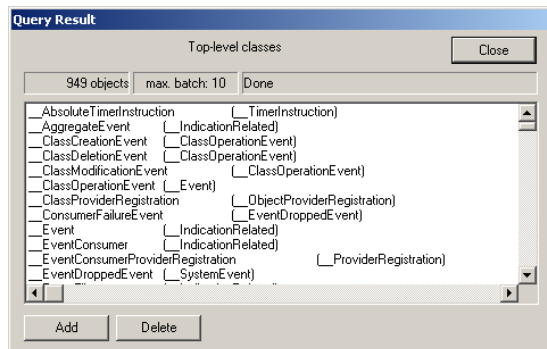
To enable the RPC service:

1. Log on to the target server with an administrator account.
2. Click **Start**, click **Run**, type `services.msc`, and then press enter.
3. Scroll the list to **Remote Procedure Call (RPC)**.

4. Right-click **Remote Procedure Call (RPC)**, and then click **Start** on the context menu.
5. Select **Recursive** without entering a superclass name, and then click **OK**.



6. If the WMI class list appears, remote WMI is functioning correctly. Go to [Verifying the firewall settings](#), and then test your Virtualization Manager credentials.



7. If the list does not appear, remote WMI is not functioning correctly. Continue reading this topic for guidance on restoring remote WMI connections on the target server, and retest remote WMI after completing each troubleshooting step.
8. Click **Close**, and then click **Exit**.

Verifying the firewall settings

To allow Virtualization Manager to collect data, the following firewall rules must be enabled:

- Core Networking
- WMI DCOM-In

If you connect to the Hyper-V host over a DMZ or otherwise employ a hardware firewall, you must make corresponding changes to your hardware firewall.

If the Hyper-V host cannot respond to ping, either open port 7 or follow the instructions in [Disabling ping discovery](#) to disable ping.

Adding the Windows Firewall snap-in

If you use a Server Core installation, you can connect to the host using an MMC connection to the host to modify the firewall.

1. Log on to a remote server that can connect to the Server Core installation with administrative credentials.
2. Press `Windows Key + R`, and then type `mmc`.
3. In the **File** menu, click **Add/Remove Snap-in**.
4. Select **Windows Firewall with Advanced Security**.
5. Click **Add**.
6. Select **Another computer**, and then enter the IP address or computer name of the Server Core installation.
7. Click **OK**.
8. Click **OK** again.

After the snap-in is added, complete the following instructions.

Enabling the core networking rules

Ensure that the core networking rules are enabled to collect information successfully from Hyper-V hosts.

Note: These may be enabled by default.

To allow core networking traffic through the Windows Firewall on Windows 2008 R2:

1. Log on to the computer you want to monitor with an administrator account.
2. Navigate to **Start > Administrative Tools > Windows Firewall with Advanced Security**.
3. Click **Inbound Rules** in the left navigation pane.
4. Ensure that all **Core Networking** rules are enabled. If not, select the disabled rule, and then click **Enable Rule** in the **Action** menu.

To allow core networking traffic through the Windows Firewall on Windows 2008:

1. Log on to the computer you want to monitor with an administrator account.
2. Navigate to **Start > Control Panel > Windows Firewall**. Switch to the Classic View of the Control Panel to use this navigation path.
3. Click **Allow a program through Windows Firewall** in the left navigation pane.
4. Select **Core Networking**.
5. Click **OK**.

Enabling the Windows Management Instrumentation (DCOM-In) rule

Ensure that the **Windows Management Instrumentation (DCOM-In)** rule is enabled to successfully collect information from Hyper-V hosts.

Note: After enabling the Windows Management Instrumentation (DCOM-In) rule, common WMI checks indicate that WMI is not enabled. This is expected behavior.

To allow WMI traffic through the Windows Firewall on Windows 2008 R2:

1. Log on to the computer you want to monitor with an administrator account.
2. Navigate to **Start > Administrative Tools > Windows Firewall with Advanced Security**.
3. Click **Inbound Rules** in the left navigation pane.
4. Click **Windows Management Instrumentation (DCOM-In)**, and then click **Enable Rule** in the **Action** menu.

To allow WMI traffic through the Windows Firewall on Windows 2008:

1. Log on to the computer you want to monitor with an administrator account.
2. Navigate to **Start > Control Panel > Windows Firewall**. Switch to the Classic View of the Control Panel to use this navigation path.
3. Click **Allow a program through Windows Firewall** in the left navigation pane.
4. Select **Windows Management Instrumentation (WMI)**.
5. Click **OK**.

Creating a new firewall rule to open the RPC ports

Open the RPC ports to successfully collect information from Hyper-V hosts. This is best done by creating a new firewall rule.

To open the RPC ports on Windows 2008 R2:

1. Log on to the computer you want to monitor with an administrator account.
2. Navigate to **Start > Administrative Tools > Windows Firewall with Advanced Security**.
3. Click **Inbound Rules** in the left navigation pane.
4. Click **Actions > New Rule**.
5. In **Rule Type**, select **Custom**, and then click **Next**.

6. Select **This program path**, and then type
`%SystemRoot%\System32\dlhhost.exe.`
7. In Services, click **Customize** to ensure that **Apply to all programs and services** is selected, and then click **OK**.
8. Click **Next**
9. In **Protocol type**, select **TCP**.
10. In **Local port**, select **RPC Dynamic Ports**.
11. In **Remote port**, select **All Ports**.
12. Click **Next**.
13. Apply to any local and remote IP addresses, and then click **Next**.
14. In **Action**, ensure that **Allow the connection** is selected, and then click **Next**.
15. Select all profiles (Domain, Private, and Public), and then click **Next**.
16. Type a name, such as `Virtualization Manager WMI Dynamic Ports`.
17. Click **Finish**.

The new rule now appears in the list of inbound rules.

To open the RPC ports on Windows 2008:

1. Log on to the computer you want to monitor with an administrator account.
2. Navigate to **Start > Control Panel > Windows Firewall**. Switch to the Classic View of the Control Panel to use this navigation path.
3. Click **Allow a program through Windows Firewall** in the left navigation pane.
4. Click **Add program**.
5. Type `%SystemRoot%\System32\dlhhost.exe` in the program path.
6. Click **Change Scope** to ensure that **Any computer** is selected.
7. Click **OK**.

8. Click **Add Port**.
9. Enter the RPC port range.
10. Click **Change Scope**, and then select **Any computer**.
11. Click **OK**.
12. Click **OK** again.

Disabling ping discovery

Virtualization Manager pings hosts before collection to quickly find or skip hosts. If port 7 is blocked, Virtualization Manager may fail to discover and collect information from Hyper-V sources. You can either open port 7 or disable the ping.

To disable the ping:

1. Log on to the administration website of the installation
(`https://ipAddress:5480`) as user `admin` and password `admin`.
2. Navigate to **SolarWinds Mgmt**.
3. Click **Edit Configuration**.
4. Select `hyper9-config.xml`, and then click **Edit**.
5. Search for `wmiexec.ping.enabled` and `wmiexec.rpccheck.enabled`, and then set both keys to false. For example:

```
<entry key="wmiexec.ping.enabled">false</entry><entry  
key="wmiexec.rpccheck.enabled">false</entry>
```
6. Click **Save**.
7. Restart the virtual appliance.

Configuring Virtualization Manager to identify ESX hosts by name

Virtualization Manager uses SMBIOS IDs to keep track of ESX hosts. Based on SMBIOS IDs Virtualization Manager builds its internal globally unique identifiers (GUIDs).

Configuring Distributed Component Object Model (DCOM) and User Account

Though SolarWinds does not recommend altering this standard configuration, if you have a business case for doing so, then you can configure Virtualization Manager to omit SMBIOS IDs and build GUIDs based on ESX host names.

Note: If you configure Virtualization Manager to omit SMBIOS IDs, you cannot rename hosts monitored by Virtualization Manager without creating an error state. Virtualization Manager will not be able to recognize the new GUID that is auto-generated.

To omit SMBIOS IDs:

1. Log on to the administration website of the installation
(<https://ipAddress:5480>) as user `admin` and password `admin`.
2. Navigate to **SolarWinds Mgmt.**
3. Click **Edit Configuration**.
4. Select `hyper9-config.xml`, and then click **Edit**.
5. Insert the following line: `<entry
key="identity.hostServer.omitSMBIOS">true</entry>`.
6. Click **Save**.
7. Restart the virtual appliance by clicking **Restart Virtualization Manager**.

Configuring Distributed Component Object Model (DCOM) and User Account Control (UAC)

Some user types and operating systems require setting changes to allow remote WMI requests. For more information, see [Connecting to WMI Remotely](#) on the Microsoft Developer Network.

| Item | Need |
|------|---|
| DCOM | Default and Limits permissions edited to allow the following actions: <ul style="list-style-type: none">• Local launch (default permission) |

Appendix A: Troubleshooting Hyper-V discovery

| Item | Need |
|----------------------|--|
| | <ul style="list-style-type: none">• Remote launch (default permission)• Local activation (limits permission)• Remote activation (limits permission) |
| WMI Namespaces | Modify the CIMV2 security to enable and remote enable the account used to access the server or workstation through WMI. Ensure the security change applies to the current namespace and subnamespaces. |
| User Account Control | Remote UAC access token filtering must be disabled when monitoring within a workgroup environment. |

Enabling DCOM

WMI uses DCOM to communicate with monitored target computers.

To enable DCOM permissions for your Virtualization Manager credentials:

1. Log on to the target server with an administrator account.
2. Navigate to **Start > Control Panel > Administrative Tools > Component Services**. Switch to the Classic View of the Control Panel to use this navigation path. You can also launch this console by double-clicking `comexp.msc` in the `/windows/system32` directory.
3. Expand **Component Services > Computers**.
4. Right-click **My Computer**, and then select **Properties**.
5. Select the COM Security tab, and then click **Edit Limits** in the Access Permissions grouping.
6. Ensure that the user account you want to use to collect WMI statistics has `Local Access` and `Remote Access`, and then click **OK**.

7. Click **Edit Default**, and then ensure the user account you want to use to collect WMI statistics has `Local Access` and `Remote Access`.
8. Click **OK**.
9. Click **Edit Limits** in the Launch and Activation Permissions grouping.
10. Ensure that the user account you want to use to collect WMI statistics has `Local Launch`, `Remote Launch`, `Local Activation`, and `Remote Activation`, and then click **OK**.
11. Click **Edit Default**, and then ensure that the user account you want to use to collect WMI statistics has `Local Launch`, `Remote Launch`, `Local Activation`, and `Remote Activation`.
12. Click **OK**.

Enabling account privileges in WMI

The account you specify in the Credentials Library must possess security access to the namespace and subnamespaces of the monitored target computer. To enable these privileges, complete the following procedure.

To enable namespace and subnamespace privileges:

1. Log on to the computer you want to monitor with an administrator account.
2. Navigate to **Start > Control Panel > Administrative Tools > Computer Management > Services and Applications**. Switch to the Classic View of the Control Panel to use this navigation path.
3. Click **WMI Control**, and then right-click and select **Properties**.
4. Select the Security tab, expand **Root**, and then click **CIMV2**.
5. Click **Security**, select the user account used to access this computer, and ensure you grant the following permissions: `Enable Account`, `Remote Enable`.
6. Click **Advanced**, and then select the user account used to access this computer.

7. Click **Edit**, select **This namespace and subnamespaces** in the **Apply to** field, and then click **OK**.
8. Click **OK** on the Advanced Security Settings for CIMV2 window.
9. Click **OK** on the Security for Root\CIMV2 window.
10. Click **Services** in the left navigation pane of Computer Management.
11. Select **Windows Management Instrumentation** in the Services result pane, and then click **Restart**.

Disabling remote User Account Control for workgroups

If you are monitoring a host in a workgroup, modify the User Account Control (UAC) settings so that local administrators do not run in Admin Approval Mode.

To modify UAC settings for a workgroup computer:

1. Log on to the computer you want to monitor with an administrator account.
2. Navigate to **Start > Administrative Tools > Local Security Policy** for Windows 2008 R2, or navigate to **Start > Control Panel > Administrative Tools > Local Security Policy** for Windows 2008.
3. Expand **Local Policies > Security Options**.
4. In **Security Options**, select **User Account Control: Run all administrators in Admin Approval Mode**.
5. In the **Action** menu, select **Properties**.
6. Select **Disabled**, and then click **OK**.
7. Restart the computer to apply the change.

Verifying credentials in Virtualization Manager

Virtualization Manager must have the correct credentials to access the Hyper-V host.

To verify the credentials, perform the following steps:

1. Log on to Virtualization Manager as an administrator.
2. Navigate to **Setup > Credentials**.
3. Select the Hyper-V credentials.
4. Click **Edit**.
5. Ensure that the user name, password, and domain are entered correctly.
6. Click **Save**.

Testing the connection between the Hyper-V host and Virtualization Manager

Testing the connection between the Hyper-V host and Virtualization Manager ensures that Virtualization Manager can connect to and gather relevant data from the Hyper-V host.

You can test the connection by creating a discovery job specifically for each target Hyper-V host. Run the discovery job after each change to test the connection.

Note: If you use different credentials for different hosts, you can request a domain administrator account to perform these tests.

Adding a new discovery job

To add a new discovery job, perform the following steps:

1. Log on to Virtualization Manager as an administrator.
2. Navigate to **Setup > Credentials**.
3. Ensure that the correct Hyper-V credentials are entered. Each credential must be added separately.
4. Navigate to **Setup > Data Sources**.
5. Click **Add**.
6. Click **Add Hyper-V hosts**.

7. Enter a group name, and click **Add Hosts**.
8. Enter the IP address of the monitored Hyper-V host.
9. Click **Save**.
10. Click **Save** again to begin the first discovery job.

The first time you add the host, discovery runs automatically.

Running an existing discovery job

To run an existing discovery job, perform the following steps:

1. Navigate to **Setup > Discovery Jobs**.
2. Select the discovery job you made.
3. Click **Run Now**.

If Virtualization Manager can discover VMs, run the associated collection schedule to begin the information gathering process.

This guide depicts the most common scenarios that can prevent data collection by Virtualization Manager. If you are unable to start collecting data, see the Microsoft articles about this topic.



Appendix B: Using PowerCLI

SolarWinds Virtualization Manager Power CLI enables you to leverage the power of SolarWinds Virtualization Manager using Microsoft PowerShell. This section contains information about the following:

- [Installing PowerShell](#)
- [Cmdlets and scripts](#)
- [Using cmdlets](#)

Installing PowerShell

Download the PowerShell Client installer from the [SolarWinds Customer Portal](#).

To download and install the PowerShell Client Installer:

1. Log on to the SolarWinds Customer Portal.
2. Under the Licensing & Maintenance tab, click **License Management**.
3. Select Virtualization Manager from the list of products, and then click **Choose download**.
4. Download the PowerShell Client for Virtualization Manager from the **Agent Downloads** section.
5. When the download is completed, install PowerCLI by double-clicking on the installer file.

You can also install the VMware vSphere PowerCLI for additional functionality if you want to take advantage of the integration of SolarWinds Virtualization Manager and VMware. You can download the VMware vSphere PowerCLI from the [VMware website](#).

When the installation is complete, select the SolarWinds Virtualization Manager PowerCLI in the start menu (or on your desktop, or QuickLaunch bar if you selected either of those options during installation), and double-click it.

The following sections detail some of the tasks you can accomplish by using Microsoft PowerShell and SolarWinds Virtualization Manager.

Connecting to Virtualization Manager

To connect to your SolarWinds Virtualization Manager server, use the `Connect-H9Server` cmdlet. For example:

```
Connect-H9Server akutz-hyper9 admin admin
```

The preceding example creates a connection to the SolarWinds Virtualization Manager server `akutz-hyper9` using the credentials `admin/admin`.

Searching in Virtualization Manager

While you are connected to a SolarWinds Virtualization Manager instance, you always have an active query. At first, the query is empty, and returns no results. Run `Set-H9Query` to set your active query and return a set of results. For example:

```
Set-H9Query * VirtualMachine
```

The preceding example sets your active query to all known virtual machines, and returns the number of results found. The first parameter is a query, just like the query you type into the search bar. The optional second parameter is the object type. In addition to virtual machines, you can search for any managed object that SolarWinds Virtualization Manager knows about. After defining the query, you can view the results with the following command:

```
Show-H9Results 1 20
```

The preceding example prints a list of items 1 through 20 in the current search result set.

All Virtualization Manager cmdlets are pipeline-aware. The following command achieves the same result as the previous example:

```
Show-H9Results | Select-Object -first 20
```

Note: The parameters are optional, meaning that you can show all the items in your result set. However, it can take a long time to display very large result sets.

Using configuration item references

Many of the operations you can perform with Virtualization Manager can involve hundreds or even thousands of virtual machines, host computers, and so forth. Because of this, most Virtualization Manager cmdlets accept and return "configuration item references." These are pointers to the actual data stored by SolarWinds Virtualization Manager.

To perform deep inspection of the actual data, use the Get-H9Doc cmdlet:

```
$xml = Get-H9Result 1 1 | Get-H9Doc
```

This returns an [xml] object, which can then be traversed and inspected:

```
PS C:\> $xml.virtualMachine.cpuAllocation
```

| limit | reservation | shares | sharesLevel |
|-------|-------------|--------|-------------|
| ----- | ----- | ----- | ----- |
| 45351 | 0 | 500 | low |

Working with the vSphere PowerCLI

If you are working with both the vSphere and the SolarWinds Virtualization Manager PowerShell snap-ins, for managed objects that SolarWinds Virtualization Manager understands (virtual machines, host servers, clusters, data stores, and applications), you can use the ConvertTo-H9Ref command to retrieve a configuration item reference for a VMware object. For example:

```
Get-Vm | ConvertTo-H9Ref | Add-H9List
```

The previous command retrieves all known virtual machines through the vSphere PowerCLI, converts each to a SolarWinds Virtualization Manager reference, and then adds them to the active list.

Cmdlets and scripts

The SolarWinds Virtualization Manager PowerCLI contains several cmdlets that provide access to a SolarWinds Virtualization Manager server.

Appendix B: Using PowerCLI

Use the `Get-Command` built-in cmdlet to retrieve SolarWinds Virtualization Manager commands. You can also use the more precise `Get-Command -pssnapin Hyper9.Powershell.Core` or the shortcut `Get-Command *h9*`.

For more information about a command, use the `Get-Help` built-in, or see [Using cmdlets](#).

The following product features are accessible through cmdlets:

- Basic session management (`Connect-H9Server`, `Disconnect-H9Server`)
- Basic collection setup (`Add-H9Credential`, `Add-H9Datasource`, `Get-H9Collector`, `Get-H9Credentials`)
- Search and facet browsing (`Set-H9Query`, `Get-H9Result`, `Get-H9Facet`)
- Active list integration (`Add-H9List`, `Set-H9List`, `Show-H9List`, `Clear-H9List`)
- Label management (`Get-H9Label`, `Clear-H9Label`, `Set-H9Label`)
- Notes (`Get-H9Note`, `New-H9Note`)
- Document DNA (`Export-H9DNA`)
- Dependency graph browsing (`Get-H9Related`)
- Retrieving and managing user content (`Get-H9Content`, `Set-H9Content`, `Remove-H9Content`, `Get-H9Report`, `Get-H9AlertRefs`)
- vSphere PowerCLI integration (`ConvertTo-H9Ref`)
- Property (`Get-H9Property`, `Set-H9Property`)
- Simple document management (`Get-H9Doc`, `Get-H9History`, `Set-H9Doc`)

For more information about the usage of cmdlets, see [Using cmdlets](#).

Scripts

The SolarWinds Virtualization Manager PowerCLI contains PowerShell scripts that can help you manage your virtual environment. Scripts are located in the Scripts directory within the SolarWinds Virtualization Manager PowerCLI directory. By default, this is `C:\Program Files\Hyper9 VEO PowerCLI`.

`vi2h9.ps1` - This script synchronizes the folder and resource pool hierarchy of a VM along with the custom fields of both VMs and hosts to SolarWinds Virtualization Manager labels.

Using cmdlets

The following table provides information about the syntax and usage of cmdlets.

| Area | Cmdlet | Description | Syntax | Example |
|--------------------------|---------------------|---|--|---|
| Basic session management | Connect-H9Server | Establishes a connection to the SolarWinds Virtualization Manager. This step is necessary before using any other cmdlets. | Connect-H9Server [-Server] <String> [-User] <String> [-Password] <String> [<CommonParameters>] | Connect-H9Server akutz-hyper9 admin admin |
| | Disconnect-H9Server | Disconnects PowerCLI from the SWVM server. You must reconnect to the server before executing any further cmdlets. | Disconnect-H9Server [<CommonParameters>] | Disconnect-H9Server |
| Basic collection setup | Get-H9Credentials | Lists the existing credentials. The available credential types are VirtualCenter, Host, and WMI. | Get-H9Credentials [-CType] <CredentialType> [-Verbose] [-Debug] [-ErrorAction <ActionPreference>] [-WarningAction <ActionPreference>] [-ErrorVariable <String>] [-WarningVariable <String>] [-OutVariable <String>] [- | Get-H9Credentials VirtualCenter |

| Area | Cmdlet | Description | Syntax | Example |
|------|------------------|--|---|--|
| | | | OutBuffer <Int32>] | |
| | Add-H9Credential | Adds a credential set for data collection. The available credential types are VirtualCenter, Host, and WMI. | Add-H9Credential [-Endpoint] <CredentialType> [-User] <String> [-Password] <String> [[-Domain] <String>] [[-Description] <String>] [<CommonParameters>] | Add-H9Credential VirtualCenter admin Admin321 testDomain "Virtual Center On 192.168.1.150" |
| | Get-H9Collector | Retrieves data collector instances. In a standard environment, there will be only one collector. In a federated installation, there will be several. Pair this command with the Add-H9Datasource cmdlet to associate new data sources with a specific collector. | Get-H9Collector [<CommonParameters>] | Get-H9Collector |
| | Add-H9Data- | Adds a server or Virtual | Add-H9Datasource [-Address] <String> [[-Description] | \$col = Get-H9Collector |

Appendix B: Using PowerCLI

| Area | Cmdlet | Description | Syntax | Example |
|---------------------------|--------------|--|---|---|
| | source | Center to the list of targets Virtualization Manager can collect against. | <code><String>] [[-Collector] <Collector>] [[-Port] <Int32>] [[-UnmanagedHost]] [[-StartNow]] [<CommonParameters>]</code> | <code>Add-H9Datasource 192.168.1.150 "Virtual Center on 192.168.1.150" \$col[0] 443</code> |
| Search and facet browsing | Set-H9Query | Sets or updates the active query. You can retrieve the items returned by the active query with the <code>Get-H9Result</code> cmdlet. The custom items are Virtual Machine, Host, Datastore, and Cluster. | <code>Set-H9Query [-Query] <String> [[-CiType] <String>] [<CommonParameters>]</code> | An active query for all VMs: <code>Set-H9Query * VirtualMachine</code> |
| | Get-H9Result | Returns the configuration item references in the current active search. The configuration items are Virtual Machine, Host, Datastore, and Cluster. | <code>Get-H9Result [[-Start] <Int32>] [[-End] <Int32>] [<CommonParameters>]</code> | Query for configuration items from the active query with result numbers starting with 10 and |

| Area | Cmdlet | Description | Syntax | Example |
|-------------------------|-------------|--|--|--|
| | | To modify the active search, use Set-H9Query. | | ending with 20: <code>Get-H9Result 10 20</code> |
| | Get-H9Facet | Retrieves a list of facets for the active query. If a facet path is specified, the cmdlet retrieves the values for those facets. | <code>Get-H9Facet [[-Path] <String>] [<CommonParameters>]</code> | <code>Get-H9Facet</code> |
| Active list integration | Add-H9List | Adds an item to the active list. You can retrieve the contents of the active list with the <code>Show-H9List</code> command. | <code>Add-H9List [-CiRef] <ConfigurationItemReference> [<CommonParameters>]</code> | Adding all hosts to the active list: <code>Set-H9Query *Hosts</code> <code>Get-H9Result Add-H9List</code> |
| | Show-H9List | Returns configuration item references for the contents of the active list. | <code>Show-H9List [<CommonParameters>]</code> | <code>Show-H9List</code> |
| | Set-H9List | If a saved list of content objects is specified, the | <code>Set-H9List [-List] <ConfigurationItemList> [<CommonParameters>]</code> | Loading a saved list, "VM |

Appendix B: Using PowerCLI

| Area | Cmdlet | Description | Syntax | Example |
|------------------|---------------------------|--|---|---|
| | | cmdlet loads the list into the active list. You can retrieve the contents of the active list with the <code>Show-H9List</code> command. | | 2008 list" to the active list: <code>Get-H9Content SavedList "VM 2008 list" Set-H9List</code> |
| | <code>Clear-H9List</code> | Removes all items from the active list. | <code>Clear-H9List [<CommonParameters>]</code> | <code>Clear-H9List</code> |
| Label management | <code>Set-H9Label</code> | Applies a label to a configuration item (Virtual Machine, Host, Datastore, or Cluster). If the label key already exists, the cmdlet overwrites the value for the target object. If the key does not exist, the cmdlet creates the key first. | <code>Set-H9Label [-Label] <String> [-Value] <String> [-CiRef] <ConfigurationItemReference> [<CommonParameters>]</code> | Adding the "OS" label with the value "Windows" to the virtual machine called "Virtual Machine Test": <code>Set-H9Query "Virtual Machine Test" VirtualMachine \$vm = Get-H9Result</code> |

| Area | Cmdlet | Description | Syntax | Example |
|-------|---------------|--|--|--|
| | | | | Set-H9Label "OS" "Windows" \$vm |
| | Get-H9Label | Returns a list of labels and values for the specified configuration item (Virtual Machine, Host, Datastore, or Cluster) reference. | Get-H9Label [-CiRef] <ConfigurationItemReference> [<CommonParameters>] | Retrieving the labels from virtual machines that are saved in the \$vm variable: Get-H9Label \$vm |
| | Clear-H9Label | Removes a label or all labels from a configuration item (Virtual Machine, Host, Datastore, or Cluster). | Clear-H9Label [[-Label] <String>] [-CiRef] <ConfigurationItemReference> [<CommonParameters>] | Removing the label "OS" saved in the \$vm variable from the virtual machine: Clear-H9Label "OS" \$vm |
| Notes | New-H9Note | Creates a new note for the specified configuration item references | [-Text] <String> [-CiRef] <ConfigurationItemReference> [<CommonParameters>] | Adding the note "Testing note" to the virtual |

Appendix B: Using PowerCLI

| Area | Cmdlet | Description | Syntax | Example |
|-------------------------|---------------|---|--|---|
| | | (Virtual Machine, Host, Datastore, or Cluster). | | machine saved in the <code>\$vm</code> variable: <code>New-H9Note "Testing note" \$vm</code> |
| | Get-H9Note | Retrieves notes for the specified configuration items (Virtual Machine, Host, Datastore, or Cluster). | <code>Get-H9Note [-CiRef] <ConfigurationItemReference> [<CommonParameters>]</code> | Retrieving notes for the virtual machine saved in the <code>\$vm</code> variable: <code>Get-H9Note \$vm</code> |
| Document DNA | Export-H9DNA | Performs an on-demand DNA diff of two hosts, two VMs, or one host and VM over time. | <code>Export-H9DNA [-LeftCi] <ConfigurationItemReference> [-RightCi] <ConfigurationItemReference> [[-LeftDate] <DateTime>] [[-RightDate] <DateTime>] [<CommonParameters>]</code> | Retrieving the differences of two VMs saved in the <code>\$vm</code> and <code>\$vm1</code> variables: <code>Export-H9DNA \$vm \$vm1</code> |
| Dependency graph brows- | Get-H9Related | Returns a list of related configuration items of the | <code>Get-H9Related [-RelatedType] <ConfigurationItemType> [-CiRef] <Con-</code> | <ul style="list-style-type: none"> Retrieving |

| Area | Cmdlet | Description | Syntax | Example |
|------|--------|---|---|---|
| ing | | <p>specified type (Virtual Machine, Host, Datastore, Cluster). The related types are the following:</p> <ul style="list-style-type: none"> • 0: Virtual Machine • 1: Host • 2: Cluster • 3: Datastore | <pre>figurationItemReference> [<CommonParameters>]</pre> | <p>the host where the virtual machine from the</p> <pre>\$vm</pre> <p>variable is hosted:</p> <pre>Get- H9Related 1 \$vm</pre> <ul style="list-style-type: none"> • Retrieving the list of VMs hosted by the host from the <pre>\$hst</pre> <p>variable:</p> <pre>Get- H9Related</pre> |

Appendix B: Using PowerCLI

| Area | Cmdlet | Description | Syntax | Example |
|--------------------------------------|---------------|--|---|--|
| | | | | 0 \$hst |
| Retrieving and managing user content | Get-H9Content | Retrieves content items from SolarWinds Virtualization Manager (alerts, saved searches, lists, trends, and so on). | <p>Get-H9Content [[-WsType] <WorkspaceAssetType>] [[-Name] <String>] [[-OnlyMine]] [<CommonParameters>]</p> <p>The Workspace Asset Types are the following:</p> <ul style="list-style-type: none"> • 0: ExportTemplate • 1: ReportOutput • 2: SavedList • 3: SavedSearch • 4: Alert • 5: Trend • 6: Dashboard • 7: ResourceContainer • 8: ResourceUsageProfile | <p>Retrieving the list of saved lists whose name includes the string "2008":</p> <pre>Get-H9Content 2 "2008"</pre> |
| | Set-H9Content | Paired with the Get- | Set-H9Content [-Asset] | |

| Area | Cmdlet | Description | Syntax | Example |
|------|------------------|---|--|---|
| | tent | H9Content cmdlet, this command makes changes to content stored by SolarWinds Virtualization Manager. | <AbstractWorkspaceAsset> [<CommonParameters>] | |
| | Remove-H9Content | Removes content items from SolarWinds Virtualization Manager. | Remove-H9Content [-Asset] <AbstractWorkspaceAsset> [<CommonParameters>] | |
| | Get-H9Report | Given a ReportOutput content item, the cmdlet downloads the related report, using the [report name].[extension] format. The cmdlet writes the files to the current working directory. | Get-H9Report [-Report] <ReportOutput> [<CommonParameters>] | |
| | Get-H9AlertRefs | Retrieves configuration item references (Virtual | Get-H9AlertRefs [-Alert] <Alert> [<CommonParameters>] | \$alarm = Get-H9Content 4 "High VM Memory Util- |

Appendix B: Using PowerCLI

| Area | Cmdlet | Description | Syntax | Example |
|------------------------------|-----------------|---|--|--|
| | | Machine, Host, Datastore, or Cluster) associated with a currently firing alert. The command retrieves only the items associated with the most current execution of the alert. | | ization" Get-H9Alertrefs \$alarm |
| vSphere PowerCLI integration | ConvertTo-H9Ref | Converts a VI PowerCLI object to a SolarWinds Virtualization Manager item reference. The cmdlet works on virtual machines, hosts, clusters, data stores, and vapps. | ConvertTo-H9Ref [-Target] <Object> [<CommonParameters>] | |
| Property | Get-H9Property | | Get-H9Property [-PropertyGroupName] <String> [-PropertyName] <String> [-Verbose] [-Debug] [ErrorAction <ActionPreference>] [-WarningAction <ActionPreference>] | |

| Area | Cmdlet | Description | Syntax | Example |
|--------------------------------------|----------------|--|--|--|
| | | | <pre>[-ErrorVariable <String>] [WarningVariable <String>] [- OutVariable <String>] [- OutBuffer <Int32>]</pre> | |
| | Set-H9Property | | <pre>Set-H9Property [-Prop- ertyGroupName] <String> [-Prop- ertyName] <String> [-Value] <String> [-Verbose] [Debug] [- ErrorAction <ActionPrefer- ence>] [-WarningAction <ActionPreference>] [- ErrorVariable <String>] [-Warn- ingVariable <String>] [- OutVariable <String>] [- OutBuffer <Int32>]</pre> | |
| Simple doc- ument man- agement | Get-H9Doc | Retrieves shallow documents for the specified configuration item references. Shallow documents are documents which do not contain child documents. | <pre>Get-H9Doc [-CiRef] <Con- figurationItemReference> [<Com- monParameters>]</pre> | <pre>Set-H9Query "Virtual Machine test" VirtualMachine \$vm = Get- H9Result Get-H9doc \$vm</pre> |
| | Get-H9History | Retrieves all the con- | <pre>Get-H9History [[-Start] <DateTime>] [[-End]</pre> | |

Appendix B: Using PowerCLI

| Area | Cmdlet | Description | Syntax | Example |
|------|--------|--|---|---------|
| | | figuration documents, stored between the specified dates. | <code><DateTime> [-CiRef] <ConfigurationItemReference> [<CommonParameters>]</code> | |



Appendix C: Using Perl SDK

If you do not already have Perl, download and install it. For Windows systems, we recommend using [ActiveState's ActivePerl 5.16](#).

Module installations

The Perl Client ::Client module requires SOAP::Lite.

To install SOAP::Lite on Linux or Mac versions of Perl, run the following command:

```
sudo cpan install SOAP::Lite
```

To install SOAP::Lite on Windows using ActivePerl 5.16, run the following command:

```
ppm install http://ppm4.activestate.com/MSWin32-x64/5.16/1603/P/PH/PHRED/SOAP-Lite-1.11.ppmx
```

Downloading the Perl Client

Download the Perl Client installer from the SolarWinds Customer Portal:

1. Log on to the [SolarWinds Customer Portal](#).
2. Under the Licensing & Maintenance tab, click **License Management**.
3. Select Virtualization Manager from the list of products, and then click **Choose download**.
4. Download the Perl Client for Virtualization Manager from the **Agent Downloads** section.

This .zip file includes the Perl Client module (Hyper9::Client) and also a few example scripts. Extract the archive in a place where you will be running your scripts from.

Using the Perl Client

The Perl Client module (`Hyper9::Client`) contains some inline POD (plain old documentation). To view the POD, navigate to the place where you extracted the Perl SDK archive and type the following command:

```
Perldoc Hyper9/Client.pm
```

Writing your first script

This example walks you through writing a script that executes a search for VMs that are configured for less than 1 GB RAM, pulls out the configuration model for each of those VMs, and prints the memory size and name of the VM.

1. Create a new file called `searchMemory.pl` and open the file for editing.
2. Set up the proper imports:

```
use strict;
use Hyper9::Client;
use XML::Simple;
use Data::Dumper;
my $pageSize = 20;
my $total = 0;
```
3. Set up your script with a `Hyper9::Client` reference and use it to log in. You must substitute the host address and credentials in the setup of the client. In the following example, it is configured to log in to a SolarWinds Virtualization Manager server found at `localhost` using the `admin/admin` credentials.

```
my $client = Hyper9::Client->new(
    username => 'admin',
    password => 'admin',
    host      => 'VirtualizationManagerHostnameOr',
);
$client->login() || die "Login failed\n\n";
```

4. Use the `$client` variable to run any of the web service operations. For a complete list of operations along with their inputs and outputs, visit <http://your-server:8983/swvm/ws/hyper9.wsdl>. To execute the search operation, insert the following code into your script:

```
# Search for VMs configured with less than 1GB memory and retrieve
their total
# memory and memory usage at the same time
my @results = $client->searchCustom(
  ciType => 'VirtualMachine',
  query => 'vm.memory:[0 TO 1023]',
  pageData => {
    pageSize => $pageSize,
    pageNumber => 1,
  },
  sort =>{
    sortField => 'vm.memory',
    sortDescending => 0,
  },
  paths => ['vm.memory', 'vm.memload.latest'], # these show up in
  'values' on the result
);
```

The result of the search call is placed into an array called `@results`.

5. Insert the following code into the script to iterate the result items that are VMs and print out how much memory they actually have:

```
# Print out the names of the VMs and their memory size, tab
delimited
print "-----\n";
print "Memory\tUsed\tVM Name\n";
print "-----\n";
foreach my $result (@results) {
  if (defined $result->{ciRef}) {
    my $memory = $result->{'values'}[0]->{'value'};
    my $memoryUtil = $result->{'values'}[1]->{'value'};
    $memoryUtil = int($memoryUtil) if $memoryUtil;
    print $memory."MB\t".$memoryUtil."%\t".$result->{ciRef}->
    {displayName}."\n";
  }
  elsif (defined $result->{'total'})
  {
    $total = $result->{'total'};
  }
}
print "....Showing $pageSize of $total\n";
```

6. Insert the following code into the script to log out:

```
$client->logout();
```

7. Save the `searchMemory.pl` file and run it using `perl searchMemory.pl`. The result should look something like the following:

```
ryankruse$ ./searchExample.pl
512MB Sarasota
768MB Jacksonville
256MB Natchitoches Parish
768MB Apalachicola
256MB Inx Lake
512MB Reunion Arena
512MB Ubuntu 64 bit
256MB Johnson Space Center
256MB Insta-Gator Ranch
768MB Clearwater
512MB Dixie Landing
512MB Lafayette
512MB Odessa
512MB River Ranch
```

Scripting tips

Whenever you receive a response from a `Hyper9::Client` call, you can place it directly into an array or a simple scalar, depending on what the web service call sends in its response.

Accepting a response into a scalar:

```
my $response = $client->methodThatReturnsSingleThing();
```

Accepting a response into an array:

```
my @response = $client->methodThatReturnsMultipleThings();
```

If you are not sure of the structure of the response variable, use the `Data::Dumper` module in Perl for an exhaustive printout of the data structure. The `Data::Dumper` is one of the most valuable modules when using the `Hyper9::Client` so use it often while developing your scripts:

```
use Data::Dumper; print Dumper(@response);
```

Using the provided example

searchExample.pl

The search example used previously is also provided in the Perl SDK .zip file, where it is called `searchExample.pl`.